Popular Astronomy

Vol. XLIII, No. 3 MARCH, 1935 Whole No. 423

The Astronomical Fraternity of the World

By DAVID B. PICKERING

PART XIII

Spring is *not* the time of year in which to see California at its best. It is then between seasons at the resorts, for it is in summer and winter that the colorful crowds flock from the cities of the mid-west to make life gay at those places. Yet it was in that season of 1931, after visiting Mt. Wilson, that Mrs. Pickering and I spent some weeks in the southern part of the state, sojourning for a fortnight at La Jolla, where despite empty hotels and deserted streets we enjoyed views of black, indented shore-lines and of ocean sunsets; and rides about the wide country side. There were motor trips to San Diego with its picturesque shore drive and tropical Balboa Park; to Point Loma and to Coronado Beach. And once we motored into Mexico and spent the day at that fastidious resort, Agua Caliente.

Upon our return north, we chose the inland route, determined to spend a day or so at the famous Glenwood Mission Inn at Riverside, a hostelry which seems to make a lasting impression upon even the most blasé traveler. There we found the courts of the inn alive with bloom; purple bougainvillea had climbed and covered many of the mission-like structures which, built at different times and representing various periods of architecture, border the central patio. We were glad to find that our hostess, Mrs. Alice Richardson, who, with her brother, owns and operates the inn, was a devotee of astronomy. She insisted at once that I meet all the local star-gazers, and to that end invited them to the inn for the following evening. She reserved for our use a group of rooms known as the President's Suite which had been occupied at times in the past by Presidents Roosevelt, Taft, and others. To these dignified quarters came Mrs. Richardson's astronomical friends, and there we spent the evening discussing astronomy in general and variable stars in particular. On the following day we called upon two members of this group who seemed especially interested in the science. First, we drove to the San Bernardino Valley Union Junior College, a new, modern school almost as big as its name, located a few miles from Riverside. There we met again an earnest, slender gentleman with thinning sandy hair who had been with us at the inn the night before. In the previous year Professor Frank B. Lindsay had come from the University of Minnesota, where he had taught mathematics and engineering, to instruct in these same sciences at the California college. To these courses had been added that of astronomy. Professor Lindsay's belief that the

observation of long-period variable stars might prove a valuable study for some of his students increased his interest in our discussions of the previous night. Later he became a member of the American Association of Variable Star Observers. It is another evidence of the popular appeal of astronomy in the west that, of the 700 undergraduates of the college, 30 were taking first year work in astronomy, while a night class of 38 adults was pursuing an extra-curricular course in that science. On long tables in the room where these classes met stood a score or more of black-painted, cement globes, upon the surface of which the students were required to prick the positions of the stars, each star thus

FIGURE 1.
DR. H. PAGE BAILEY AND HIS 15-INCH REFLECTOR AT RIVERSIDE, CALIFORNIA.

showing a bright spot on the dark surface of the celestial sphere. Though this was Professor Lindsay's first experience in teaching astronomy there was no doubt of his keen interest in the subject and we learned that he was much in demand as a lecturer on star topics. We visited the college observatory where a crudely mounted 16-inch Mellish mirror was housed in a building so new that the cement of its walls was still moist. Here we were joined by Dr. H. Page Bailey, another guest of the previous evening, whose home we were about to visit. It was Dr. Bailey who later constructed a modern mounting for the Mellish mirror from his own original and distinctive design. With Dr. Bailey we drove back to his home in Riverside, in which are his dental offices. The wide

grounds about the low house were rich with growing things—trees, bushes, vine-covered arbors, and beds of flowers. It soon became evident that this easy-mannered, middle-aged chap with the sharp, gray eyes had a head full of ideas and a body full of energy—one of those rare human specimens gifted with imagination and ingenuity—hungry for knowledge, persistent, versatile. Obviously Dr. Bailey was a man of many hobbies. Near the center of his garden was a round pool wherein were growing over 80 varieties of Egyptian water lilies. Nearby were crates containing 2000 root sections which were being prepared for shipment to some florist in an eastern state. Here was a hobby which in the course of eight years had developed into a profitable, commercial activity. In separate outbuildings were the Doctor's tool-house and work-shop and in another was a large aquarium full of rare fish. Located conveniently near his house were the mountings of three telescopes of various sizes. From further investigation, prompted by our interest in this unusual person, we found that Dr. Bailey had come to California from Wisconsin in 1901 and had begun dental practice in Los Angeles in 1911. Before that, however, he had constructed an X-ray machine for dental needs and, with cameras which he himself had built, had made thousands of feet of film depicting micro-organisms. Later he became interested in archery and in 1926 the Southern California Archery Club, which he had established, held its first tournament. After this we were not in the least surprised to learn that he was an expert pistol shot. We could not learn why he had taken up these earlier pastimes, but we do know of the chance that led to his interest in astronomy. It was in 1926 that a patient who couldn't pay his bill, tendered him in settlement a piece of glass that was believed to have come from the San Gobain works in France, with the casting for the 100-inch Hooker mirror. With this Dr. Bailey began the construction of a 15-inch reflector, later making two of 8 inches and one of 12. As a mounting for the 12-inch he procured castings from Mr. John M. Pierce of Springfield, Vermont, but finding no type of mounting that quite satisfied him, he determined to make one of his own for the 15-inch mirror. Here we saw the successful result of that experiment. There was a pit about three feet deep whose rim was covered with an old automobile frame which served as a base for the mounting. The pit was lined with corrugated iron and two parallel walls of this metal rose at its sides several feet above the ground level and were oriented to the north, their upper edges sloping to conform to the angle of the polar axis. From each open end of this housing were erected concrete pillars of proper relative heights, to which were attached the bearings holding the ends of the fork-type mounting. This one, however, was of the "split-ring" variety; a ring attached at right angles to the open end of the fork, rested in its cradle upon two ball-bearing rollers, allowing the forked axis to turn smoothly in declination. The ring was cut away above the fork ends and counter-weighted, thus permitting the tube to lie within the arms of the ring and parallel to the polar axis. The tube itself was

beautifully made. It was constructed of 24 hard-wood staves with splines of hard-wood between each pair. These had been soaked in hot linseed oil and cemented together with white lead. T-iron hoops secured the ends and, in between, the tube was bound by three brass bands. When we were there the mounting had not been finished, but Dr. Bailey was planning a synchronous motor-drive in anticipation of using a 4x5 plate-holder at the Cassegrainian focus. An adjustable step was set in the side walls of the pit for convenience in observing. To the southern end of the base was hinged a light, canvas-covered frame which folded over the outfit when the telescope was at rest, and, by making contact with the raised sides, formed a protective roof.

It seemed to be a sturdy, smooth-running, easily-operated device and one in which its builder might take both pride and pleasure. It was a mounting of this type that Dr. Bailey later constructed for the 16-inch mirror at Junior College.

As we rolled along roads bordered by palm trees and orange groves on our way to Los Angeles, I pictured Dr. Bailey fitting an inlay into the molar of some innocent patient. Hands and fingers followed their trained procedure but his mind pictured the next shipment of lily roots, or an arrow speeding toward a bullseye or, more likely still, the appearance of Saturn on a perfect night in that 15-inch telescope.

It was a month later when we arrived in Oakland after motoring from Yosemite National Park, where for ten days we had lived enchanted. We had accepted an invitation from Professor Earle G. Linsley, Director of the Chabot Observatory, to attend the monthly meeting of the East Bay Astronomical Association to be held at the observatory on May 20. As soon as possible after our arrival I called upon Mr. J. H. Skaggs, the President of that thriving, amateur society, with whom I had long corresponded. Though but one or two of the eastern members of the American Association of Variable Star Observers had ever met Mr. Skaggs, his services to that association were well known. He was the Regional Adviser for the coast of the A.A.V.S.O. and the creator and producer of the association's publication, Variable Comments. Furthermore, in connection with its Patron, Charles E. Barns, of Morgan Hill, California, he had often come to the assistance of the association in the making of its catalogues and listings.

On the morning of the 20th, I found Mr. Skaggs busy with his type in the shop back of his residence on Athens Avenue and the big, genial printer seemed as happy to see me as I had been keen to meet him. Big-boned, broad-shouldered, nearly bald, with a smooth, round face on which seemed to rest always a quizzical half-smile, Skaggs rose slowly from his bench. With a natural dignity emphasized by a slow, ponderous deliberation of movement he removed his printer's apron and though it was not yet ten o'clock said "*My* day's work is *over*." There are many rare chaps in the world whom we have never met, but with whom we maintain close touch through correspondence, sharing their enthusiasms—their joys or regrets. Harry Skaggs was one of these

old friends whose hand I was at last permitted to grasp. First of all I must meet his wife, his chum and working partner in each of his many enterprises, though she was sole master of her prolific garden. It was only a year or so after our visit that we learned of the passing of this good woman, and felt the emptiness that must have come into Harry's life. They were both versatile musicians, each playing many instruments. One could well imagine that the sight of Harry in his bandmaster's uniform would prove an inspiration to the organization he proudly conducted. I should like to have seen him on such an occasion.

FIGURE 2.
J. H. SKAGGS AND HIS OBSERVATORY, OAKLAND, CALIFORNIA.

Upon the roof of his print shop an outside stairway lead to the conical "dome" of his observatory. Here were his 5-inch refractor, his books and accessories and a projector with screen for showing his friends slides of things celestial. And here one night we had the fun of observing variables together. Harry and his wife took us for luncheon to a local hotel where we ate upon a veranda which overlooked a charming view of what Oakland boasts as the only salt-water lake in any city.

Fortunately for us, Harry was to drive us to the Chabot Observatory, for after that seven mile ride to the Mountain Boulevard in Leonia Heights, I am sure that I could never have found the place.

Chabot is unique in being a municipally owned observatory, controlled by the Board of Education of the city of Oakland. It is intended to serve all of the pupils of the public school system, as well as those of nearby Mills College, and the public is welcome at all times except when science classes from the schools are receiving instruction. Saturday evening is called "Public Night" for at that time there are no scheduled

programs for pupils. How the observatory came to be makes an interesting story. It was back in 1883 that Mr. Anthony Chabot, who has been referred to as Oakland's largest single benefactor, presented the city schools with an 8-inch Clark telescope. At various subsequent times, the Board of Education acquired a sidereal clock, a chronometer, a chronograph, and a 4-inch transit instrument. All these were housed in a small building in the city and placed under the care of a man who was known as the "astronomer-in-charge." Later events make one wonder whether the Board could have realized its wisdom in selecting the man it did for that job, for Mr. Charles Burkhalter, the appointee, was remarkable in many ways. He was a good astronomer and a worker; ambitious for his little institution and gifted with infinite patience. He might have been said to have a one-track mind, but, in his case, mind and heart were yoked together to pull a long trail. When Anthony Chabot died on June 6, 1888, he left to the little observatory the sum of $10,000. This Charles Buckhalter placed in a bank and resigned himself to "wait for it to grow." It is true that there were times when he would have to draw against this precious capital for observatory needs, but he was often heard to say that he was "working and waiting for Rachael." At last, after twenty-five years of hope deferred, a contract was given to Warner and Swasey for a 20-inch refracting telescope, with a Brashear leans, and when this instrument was placed beneath its 28-ton dome in the modern observatory on Leonia Heights, Charles Burkhalter saw his dream come true.

Across the mounting at the base of the telescope is a simple plate bearing the single word "Rachael." Seven years later a larger bronze plate was attached to the mounting below the first, for Charles Burkhalter had passed away. The new plate bore his portrait in relief, and the dates 1885-1923 and cast into the bronze were these words: "He devoted his life to the youth of Oakland that they might know eternal truth as it is written in the stars."

Upon our arrival at the observatory we were welcomed by Professor Linsley, his assistant, Mr. Clifford E. Smith, and the Secretary of the Institution, Miss Margaret C. Walker, a cousin of the Director. With them were a dozen or so variable star addicts, come as an advance guard of the East Bay Association to discuss variables with us before the monthly meeting of the association in the evening. To add to our joy, we discovered in this group our friend, Dr. Alice Farnsworth of Mt. Holyoke College, who was spending the major part of her sabbatical year at Lick, and had come all the way from Mt. Hamilton to see us. And what a good time we had! We visited and chattered about everything. We inspected the observatory. We gathered about a huge table upstairs and talked variables until we were called to supper. On the observing floor under the big dome, at the base of the 20-inch telescope, a long table, laden with good things, was presided over by the ladies of the staff. It was an indoor picnic and gave us a chance to get better acquainted with the Director, his wife, and their two charming daugh-

ters. It seemed as if, in accepting the mantle of Charles Burkhalter, Professor Linsley had assumed those qualities of energy and patience so marked in his predecessor. We wondered where, in his busy life, this serene and placid gentleman found time for rest. With innumerable lectures at school and college, the hordes from the city falling upon the observatory in organized and unorganized groups, the set lectures on Saturday nights, the guidance of the East Bay Astronomical Association, the work of the observatory itself, and I know not what other duties, where could he find time to mop his brow and "call it a day"?

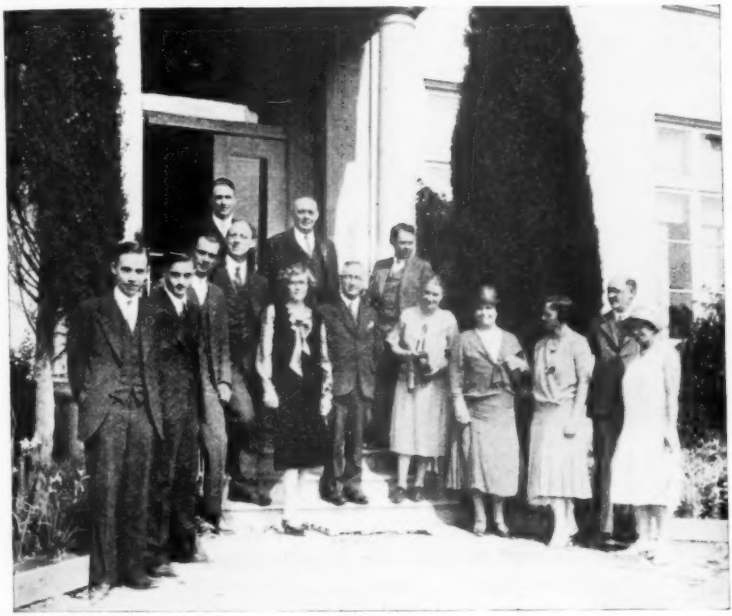

FIGURE 3.
MEMBERS OF EAST BAY ASTRONOMICAL ASSOCIATION, IN FRONT OF CHABOT OBSERVATORY, OAKLAND, CALIFORNIA.

We lingered over the feast until the adjoining auditorium had begun to fill with other members of the East Bay Association, come to attend the monthly meeting.

There we enjoyed the program conducted by Mr. Skaggs, who well succeeded in entertaining his friends from the east. Riding home with the Skaggs at a much later hour we felt that comfortable, friendly glow that comes to those who have learned the meaning of western hospitality.

A few days later we motored from Oakland to San Jose, and the

next day started from that thriving city to visit the Lick Observatory.

It was late May and such a day as the California booster likes to tell about. Mt. Hamilton lies due east of San Jose and as we approached the suburbs of the city over level, brick-paved roads, we could catch glimpses here and there of that white mushroom on a distant peak that we knew to be the big dome of the observatory. It is 25 miles by road from the center of San Jose to the summit of Mt. Hamilton, but to the curve-ignoring crow it is but 13 miles. About three miles out of town we turned onto a gravel road and at once began winding upward. Unlike the trip up Mt. Wilson, we traveled here over well graded road-

FIGURE 4.
LICK OBSERVATORY.

beds while the country about us, instead of being closely wooded, opened into orchard and fruit farms giving a picturesque beauty to the landscape that extended about and below us. We did not count them, but are willing to accept the statement that we negotiated 612 curves, mostly of the hair-pin variety, during our ascent. Finally we rounded the last curve of all and came to rest at the top of the world directly alongside the 75-foot dome.

Here, with our feet firmly on the ground, we could, for the first time, fully enjoy the grandeur of the scene that stretched across the valley below. The gracefully rounded, treeless peak seemed to cleave space like some battle-ship of the gods, having on its bow, as chief superstructure, the huge, white dome of the observatory. The care-taker, Mr. Corona (and never a more appropriate name was tagged to the person of an observatory guardian) had advised Dr. Farnsworth of our arrival, who, after a warm greeting, took us to our room in the building known as the dormitory.

From the site of the observatory the land falls away in three direc-

tions while to the eastward the spur extends in a series of rising knolls. The nearer of these bears the name Kepler and another some distance beyond is called Copernicus. The narrow road that winds eastward from the observatory is bordered by the homes of staff members, the school-house and the community dining room.

Upon a lower level to the south are other houses, including the home of the Director Emeritus, Professor William Wallace Campbell. Also, in this section, is located the famous Crossley reflector.

The story of how this pioneer institution came into being may be an old one to many, but for younger people, interested in the history of the science, it may be worth repeating. It was in 1847, two years before the famous California gold rush, that there came to San Francisco from Hanover, Pennsylvania, a man who had made fame and fortune as an organ builder. Through land investments in this new country his fortune grew to millions. Nobody knows what prompted James Lick at the age of 78, two years before his death, to execute a deed of trust in which a board of trustees, whose members he had selected, were ". . . to expend the sum of seven hundred thousand dollars ($700,000) for the purpose of constructing . . . a powerful telescope, superior to and more powerful than any telescope ever yet made, with all the machinery appertaining thereto and appropriately connected therewith, or that is necessary and convenient to the most powerful telescope now in use, or suited to one more powerful than any yet constructed, and also a suitable observatory connected therewith."

Provision was made in the deed for the completed observatory to be conveyed to the Regents of the University of California and it was to be known as the Lick Astronomical Department of the University of California. The site originally selected was upon the borders of Lake Tahoe, in Placer County, but this was abandoned after many other vantage spots had been investigated and in 1875, a year before Lick's death, Mt. Hamilton, with an altitude of 4200 feet, had been chosen. No less an authority than Professor Simon Newcomb was employed by the Trustees to visit Europe and investigate the making of telescopes and telescope glass. As part of the condition under which the observatory was to be built on Mt. Hamilton, the officials of Santa Clara County built a fine road to the summit at a cost of $78,000, and this was completed in 1876. In all 3130 acres were eventually acquired for observatory purposes. In his report to the Trustees, Professor S. W. Burnham stated that the conditions for observation are "not to be hoped for in any place with which I am acquainted and . . . are not to be met with elsewhere." In 1885 Professor Edward S. Holden was appointed President of the University of California, and Director of the Lick Observatory, though it was not until 1888 that the construction of the observatory was completed. For this, $610,000 had been expended. The main building, containing offices, computing rooms and library, forms the connecting link between the 36-inch and 12-inch refractors. At other places about the grounds are housed the 36-inch reflector, presented to

the observatory by Edward Crossley of Halifax, England, the 6-inch Crocker telescope, houses for storage, photographic dark-rooms, instrument shops and dwellings. Adequate reservoirs and pumping stations were also provided.

Alvan Clark and Sons received the contract for making the great refractor, while Warner and Swasey constructed the mounting. The success of this major undertaking must have enhanced the reputations of both of these firms and gone far to make famous their combined names in the world of astronomy. Alvan G. Clark also figured a photographic correcting lens of 33-inches aperture for use with the big refractor. It was the Clarks who built the 12-inch instrument and the 6½-inch meridian circle, though the mounting of the latter is by Repsold.

Needless to say, numerous instruments of minor importance have been acquired from time to time, mostly as gifts from interested friends. Among these are the Brashear 6½-inch comet-seeker, given by Miss Catharine Bruce; the 6-inch Willard-Brashear photographic telescope, the gift of Regent Charles F. Crocker, which bears his name; the 5-inch Clark telescope given by the daughter of Captain Richard S. Floyd, who was President of the Board of Trustees and who did so much in the way of investigating and planning in pre-construction days. Donald Ogden Mills had given the three-prism spectroscope; William Randolph Hearst had presented seismographs, and Dr. Ambrose Swasey, the Moll registering micro-photometer. It was also Mr. Mills who, in 1900, equipped the Lick station in the suburbs of Santiago, Chile, with its 37¼-inch reflector and spectroscopes and who supported this branch of the observatory until his death in 1910.

As Dr. Farnsworth showed us about the buildings we met first one and then another of the interesting people who inhabited the mountain top. There was Mrs. Moore, the wife of Professor J. H. Moore, who kindly invited us for tea that afternoon at her home. Then who should come along but Professor W. H. Wright whom we had last seen at the Leiden meeting of the International Astronomical Union in 1928. He was as big and quiet and smiling as ever, though we recalled one occasion when the smile was not so manifest, and that was when the British authorities made some technical objection to his bringing his movie films of Jupiter into the country. We remembered Professor Turner's indignation on that occasion and his recourse to the Englishman's Court of Last Appeal, the London Times. Professor Wright asked us to his home for bridge on the next day. Just outside of the main building we were introduced to Dr. Frederick Whipple, who was soon to go to the Harvard College Observatory to succeed the late Professor King in directing the photographic work of the observatory. As he had never visited Cambridge, he was interested in hearing all about it, before pulling up stakes and taking his young wife across the continent. With Dr. Whipple were two other young men of the staff: Doctors Thorndyke and Anderson, and all three joined us in our inspection of the ob-

servatory. It was from those gentlemen that we learned a trick of major importance. Despite the universal prohibition of smoking in observatory buildings, one is tempted occasionally to sneak a cigarette in some quiet corridor and, to bury the evidence of this infringement of the rules, one uses the cuffs of his trousers for ash-receivers. Whether at some later period one removes the butts, burned match-ends and ash from these improvised receptacles is a matter of memory and personal taste. Before going into the main building we were joined by Mr. F. C. Chappell who showed us some colored photographs of wild flowers which he had recently taken—beautiful things, particularly one of a red-topped thistle.

In her office we met the Secretary, Miss Leslie Potwin, and were there joined by Miss Catherine Stillman, "Pat" to her friends, that dark, demure daughter of Mt. Holyoke whom we had first met at the New England college on the memorable trip when "Baron" Yalden and I had piloted Dr. W. H. Steavenson to the eastern observatories in 1930. And here was the same "Pat," whose dark hair, parted just west of the cranial meridian and smoothed sleekly back, accentuated the Mona Lisa expression of her oval face. Not long after our visit, "Pat" transferred her services to Vassar and is now associated with Dr. Caroline Furness. And then, along came "Beckey," Miss Rebecca Jones, whose light, curly locks and beaming countenance contrasted sharply with "Pat's" twilight type. "Beckey," too, left Mt. Hamilton later and is now with the Harvard College Observatory. These two daring ladies were even then making their plans to drive east with Dr. Farnsworth upon her return. I concluded that "Beckey" was to be chauffeur in chief, for the other two were just learning to drive the little car which bore the snappy name of "Yellowjacket." What are thousands of miles of motor travel over mountain and plain to ladies who are accustomed to traveling thousands of light-years through space?

It was four o'clock on this first afternoon that we drove with Miss Farnsworth along the winding road that leads past the community school, where the ten children of the staff members struggle with the three R's, to have tea at the home of Professor and Mrs. Moore. We found the big, sandy-haired Professor beaming and enthusiastic, his wife quiet and efficient. Only one of their two daughters, then aged 17 and 10, was at home, looking, with her bobbed hair and loose overalls, like a true daughter of the hills. Dr. Farnsworth assisted Mrs. Moore in the service of tea and delicious angel cake and rich, yellow sponge cake, all of which I enjoyed after having deposited the first warm, wet cupful of tea in my lap, in a vain and greedy endeavor to juggle cup, saucer, and cake-plate into serviceable position. Cold tea has not an attractive sound at best, but when applied externally there is something penetrating and repulsive about it. Sitting with one's trousers saturated with cold tea, is not conducive to blithe conversation.

Nevertheless it was a friendly hour, filled with discussion, reminiscence, and refreshment. On our return to the observatory we passed

the foot of that steep path of cleated boards, known as the "chicken-walk," which leads from the road-way to the dormitory, and, leaving our car at the parking space just back of the big dome, entered the house by the rear door. After an hour of rest we were ready to leave with Dr. Farnsworth for the Director's residence where we had been invited to dine with Dr. and Mrs. Aitken. They gave us a cordial welcome and led us into the comfortable living room filled with such social trophies as one expects to find in old homes. Professor Aitken is tall and straight with thinning gray hair, and, though quiet and dignified, the surface of his conversation is broken by bubbles of humor. Something in Dr.

FIGURE 5.
"CHICKEN WALK" LEADING TO THE DORMITORY.
DOME OF 36-INCH REFRACTOR AT LEFT.

Aitken's bigness and carriage, the expression of his features, reminded me of Professor George Willis Ritchey. He told me that many people thought he looked like Dr. Walter S. Adams of the Mt. Wilson Observatory, which was quite true. In Mrs. Aitken we found the type of pioneer wife, gray-haired and buxom, self-reliant, cultured, and vivacious, her ready wit cutting across her husband's quiet humor. She entertained us with stories of her early experiences; of her struggle to provide an education for her three boys and one girl in this remote place; stories of the home sabbath-school, at one session of which, while explaining the creation of woman from man's rib, one of the youngsters asked "Did Adam have to take chloroform?" And now there were

seven grandchildren to command her pride. All of her reminiscences were punctuated with bits of quoted verse. Of the dinner that followed I recall most vividly those tender lamb-chops, baked in a spicy catsup sauce and each adorned with its slice of lemon. Replete with the feast of food and anecdote we set out at last for the dormitory, and after depositing Mrs. Pickering in her room, Dr. Farnsworth and I stole out

FIGURE 6.
PROFESSOR ROBERT G. AITKEN, DIRECTOR OF LICK OBSERVATORY, AND MRS. AITKEN.

to the big dome, under which we found Professor Moore intent upon making spectrograms of Beta Cor Bor and 12 Comae Berenicis, using the three-prism spectroscope which was attached to the 36-inch refractor. I was fascinated in seeing the flash of the titanium spark used to mark the plate with a standard of comparison for determining later the desired velocities. We examined Professor Moore's device which electrically controls the temperature of the interior of the tube to 1/50th of a degree.

It was after midnight when we returned to the dormitory, outside

of which the thermometer registered 56 degrees on this May night. Before turning in we stood and looked across the cloud-filled valley. The moon, in her last quarter, flooded the sea of mist that stretched to the horizon. At wide intervals rose the conical tips of peaks, dark islands rising from a white sea. Nothing we had heard of this picture could express the wierdness of its ghostly beauty. Awed and chilled we sought the warmth of the dormitory. Our first day at Mt. Hamilton was over.

JANUARY 3, 1935.

The Old Princeton Observatory and the New*

By R. S. DUGAN

I am writing this after twenty-seven years of servitude in the old Halsted Observatory and two years of recuperation, while the new telescope was being built, and just as I am beginning to realize the satisfaction of work in the new Observatory.

Those who lived near the Halsted in their student days know what awful noises the dome used to make. The base of the dome did not hold its shape very well, the track on which it rolled was of railroad iron, and the dome buckled and banged as it tried to take the curve. Once in a while a flange would break from a tortured cast-iron wheel and fortunately always miss the observer. When so many wheels had lost their flanges that it became doubtful whether the dome would stay up there in a gale of wind it was jacked up and a new set of wheels put under.

The dome was turned by means of a chain that went round the dome and down over a sprocket wheel. Power was furnished by a storage battery charged by a dynamo in the School of Science, provided the underground cables had not been cut by some ditch digger. The astronomer slowly threw on the power, like the motorman on the Trenton Trolley, with his right hand tugged at a wheel like the steering wheel on an ocean freighter to start the dome rolling, and with his left pulled a rope which led to a clutch on a belt shaft below. If the whole maneuver was executed just right the belts did not all fly off and the chain did not break.

Each of the hundreds of links in the chain wore, in use, until the chain lengthened and lost its grip and went rattling around the dome accomplishing nothing. Then we had to close up until one of us got up the courage to ask F. Fisher, University Mechanician, to take out a section of five or six links. After a few years anyone could see by the

*Reprinted with minor changes from the *Princeton Alumni Weekly*, October 12, 1934.

pile of loose links that we had taken out more than the chain originally contained.

The shutter was pulled up by a rope that passed over a large wooden wheel high up on the dome and under a wheel below the floor. The astronomer turned on the power, coaxed the motor to full speed without having the belts fly off, opened a trap door in the floor, lowered the rope with both hands and skillfully allowed a prong on the spinning wheel to hook the rope into the channel. Then with an agile leap across the hole he took up the slack with a snatch block. It took two years to learn this trick, and all our graduate students will remember hanging head downward in the hole untangling the rope. One of them will also remember the night the rope came off the upper wheel. There was an iron

Photo by R. S. Dugan.

HALSTED OBSERVATORY, PRINCETON, NEW JERSEY.

balcony round the top of the wall, about three feet wide and about fifteen feet from the floor. On this he placed the foot of a ladder, as near the inner edge as possible, resting the top against the dome close to the wheel. The ladder, being some twelve feet long, was nearly straight up and down. When he had climbed a few rungs, the top of the ladder swung in from the dome and hesitated while deciding which way to go, but as it finally swung softly back, the astronomer continued his ascent, put the rope back in place and reverently made his descent. And good observations cannot be made with shaky nerves or twitchy muscles.

The telescope was swung into the desired position by means of three ropes. It was clamped in position by another rope, and the slow motion was worked by still another, which one carried up the observing chair and hung on the end of the telescope. Fumbling for it in the dark he usually dropped it three or four times in the course of the night and had to climb down a dozen feet to retrieve it. Unless the astronomer

was constantly watchful some of the wires which dangled about the mounting would catch in any one of a number of possible places and be pulled out by the roots. When this happened he climbed on the telescope from one precarious foothold to another, up some twenty-five feet, and made his repairs.

The driving clock was too light for its work. It had to be adjusted constantly, which involved another climb, and in cold weather could hardly be coaxed or browbeaten into going at all. Zero weather lubricating oils had not been developed. I remember one night squirting a new kind of oil onto a bearing, that was so cold my finger had just stuck to it, and seeing the oil immediately change into ice-cream.

When the driving weight—about 300 pounds—got near the bottom of its run it had to be wound up by hand. The rope was on the opposite side of the pier where you could not see the weight. You had to learn just how many full-arm pulls would bring the weight to the top. One night as I was finishing the last pull—one had to put a good deal of vigor into it,—there was a bump and a terrifying crash. The weight had bumped the top, the endless chain, which carried the main and counterpoising weights and which was made up of loose links, had come apart. The weight was wedged in the well in the floor and the dismembered chain was scattered about in apparently thousands of fragments. It was the last night in the season that I could observe the eclipse of a star I was working on. With what patience I could summon I assembled the chain and worked it over the various sprockets, rigged a tackle, pried and tugged, and finally hoisted the weight up where I could slip the last two links together. Then I went back to observing—which requires calm judgment and perfect muscular control.

The telescope pier was built very high to allow clearance for mounting Professor Young's long spectrograph at the eye end. The observing "chair" had to be correspondingly high. When one climbed down to move the chair, which had to be done about every fifteen minutes to follow the telescope, the casters were usually headed in four different directions and it was no easy job to budge it. When, however, one was at the top of the chair and wished to push the telescope instead of the chair, the four casters would be perfectly aligned and the chair would shoot out from under him. One night the observer lost his balance and swung out into dark space. His foot caught and held until he had slapped head down against the chair, then came free and allowed him to slide to a heap on the floor. The University exchange had closed at twelve so he slowly limped home with a badly sprained ankle (every night since then the observer's wife has said "Now, be careful!").

The observer hitched a seat, and himself, up and down the inclined front of the chair to keep pace with the telescope. One night the observer suddenly left the eyepiece, when the rope to the counterbalancing weight broke, and he later discovered himself on the floor piled up against the granite pier. We tried to inspect such parts of the equipment regularly but it was difficult to remember all the things that might

get out of order. We had to make most of our own repairs, for our annual departmental appropriation was $300. This was exclusive of salaries, which were somewhat higher.

Most of our graduate students—Daniel, Joy, Shapley, McDiarmid, Sitterly, Dunham, Fairley, Menzel, Kovalenko, Bennett, Merrill, and Green—have had to learn to use the Halsted equipment and I do not know of any other observatory where they could have gotten an equally varied and thorough training in practical astronomy. We have kept a record of each night's observing since 1905 and these record books show that observing at the Halsted developed a vocabulary and released one from inhibitions. The last entry of one of our graduate students (now a dignified director of an observatory), written at a temperature of 11°, reads

> "Driving clock froze, dome froze tight, reading lamp busted, phone won't work, sidereal clock played out, belts off, fuse burned out, shutter can't be closed—vale!"

I shall not attempt here to review the astronomical pioneering of Professor Young when the equipment was a wonder of modernity, but we feel that we also have a right to be proud of the amount of work accomplished in the last twenty-seven years of the life of the Halsted. Fortunately the dome was set very high so that the telescope continued to overtop trees and buildings, but street lights and other nuisances of civilization had been very annoying for some years. The regular observing program has been the measurement of the brightness of eclipsing variable stars. Since 1905 we have made something like 375,000 measurements on stars of this type.

When the Halsted Observatory was dismantled, the two big lenses were taken out of one end of the tube, carefully washed and dried, packed in a box among plenty of old quilts, and stored in the bank. The eyepieces were also kept for use in the new tube, and the driving clock —not the one I have been talking about, but a new one installed about twelve years ago—was salvaged. A few parts of the telescope and a few accessories were saved as curiosities. All the rest was junked. A stone from the outer wall, on which is chiseled "Halsted Observatory, 1867" was placed on the old site, flush with the surface of the ground, to preserve the memory of the building and the carefully determined latitude and longitude. The better part of the stone was used in the walls of the new building while the poorer part was broken up for ignominious use as road material.

A large area has been marked off as the "Observatory Area" so that no encroachment of buildings or lights shall impair the horizon, the dark sky, or the "seeing."

After much discussion among ourselves we could think of no better name than New Observatory. This will serve to distinguish it locally. Perhaps after the newness is worn off a more lasting name will suggest itself. The stone tablet from the inner wall of the old dome has been placed in the wall of the reception room as a renewed recognition of our

obligation to General Halsted. The observatory as an institution which includes all our activities is known to the astronomical world as the Princeton University Observatory. The offices are in the Observatory of Instruction, on Prospect Avenue.

The design of the new building is the result of many conferences between the Supervising Architect of the University, the Department of Grounds and Buildings, and the astronomers. The two former showed much patience in trying to make the plans meet the wishes of the astronomers and still promise to result in a presentable building. The

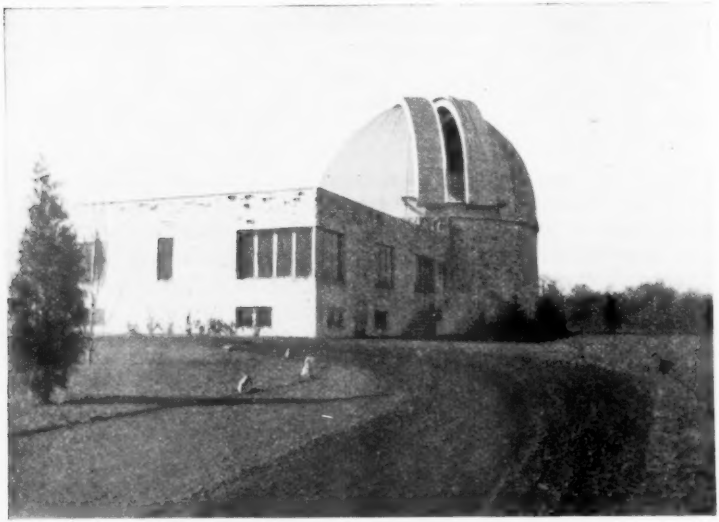

Photo by William Hunt.

THE NEW OBSERVATORY, PRINCETON UNIVERSITY.

problem of the height of the telescope and of the walls relative to the rest of the building and of headroom on the staircases and in the doorways about the dome presented many puzzles.

We wanted many single-pane windows in which we could examine photographic plates. A gas furnace was decided upon to avoid smoke and convection currents—a little steam escapes quietly from a small hole near the top of the rear wall. In the basement is an instrument room in which we already have a densitometer for the measurement of photographic plates; a room which is called a shop because it has a bench in it; and a dark room long enough for experimental work. One can also go through under the floor of the dome where most of the machinery for the operation of the telescope is located. On the main floor are comfortable quarters where a caretaker can live and the observer can warm up while he is waiting for the clouds to roll by and

cook himself a midnight lunch. Next to the dome is a narrow hallway, serving as an airlock to keep the heated air of the rest of the building from entering the dome. The dome, the floor, and the telescope, and the installations for their operation were supplied by J. W. Fecker of Pittsburgh. Several new features were required which added to the difficulties of design. They seem to have been very successfully solved.

As the observer enters the dome, he turns on the power and a set of lights round the wall. The shutters roll off easily to the sides. Curtains can be pulled up from the bottom and down from the top (by throwing a switch) to keep out moonlight and wind. At the south end of the pier is a panel of buttons. Push one button and the whole floor begins to rise, push another and the dome begins to turn. Push other buttons and the telescope will swing to the east or the west, push another set and it will swing north or south. A pointer on a dial on either side of the control panel keeps pace with the telescope and shows just where the telescope is pointing in right ascension and declination. The controls are duplicated at the eye end of the telescope and in addition there are controls to give slow motion and slow slow motion in the two coördinates.

An iris diaphragm over the objective can be operated from the eye-end if it is desirable to cut down the brightness of the object being observed. The tube extends out about two feet in front of the objective to prevent the settling of dew. The rising floor will make it possible for the astronomer to do most of his observing from an ordinary chair, with a table to hold his notebook and timepiece. In fact there seems to be no reason why he cannot have the comfort of a morris chair. What a difference from working in the Halsted Observatory!

STARS

Our little world fares bravely through the night
For though before her stranger darkness lies
A host of friends attend her in the skies.
The Bears point northward with their lamp, the white
Polaris, and the Great Dog's greatest light
Blazes a nearer trail till Sirius dies:
Then, up the springtime east, new torches rise
As down the west old beacons fade from sight.

That whirl of golden moths, the Pleiades,
Orion's giant suns, the red-eyed Bull
Depart and the wee wanderer knows loss
Of Gemini's twin flames: instead she sees
Altair and Scorpio, the beautiful,
Between the Northern and the Southern Cross.

LILIAN WHITE SPENCER in *The Commonweal.*

Time Signals on Short-Wave Radio

By CHARLES H. SMILEY

The work of determining the time from the stars is done so quietly and efficiently that the average citizen is seldom aware of it. Indeed, many persons do not know that the U. S. Naval Observatory in Washington, D. C., performs this valuable service and serves as an authority on time for the United States. The average citizen obtains the time indirectly, often through the announcements by radio broadcasting stations. For most purposes, these announcements are sufficiently accurate.

Only a few persons need to know the time with greater accuracy than to the nearest minute. Jewelers do if they are to test the time-keeping qualities of watches and clocks, and if they are to provide the correct time for their customers. Railroad men concerned with the movements of trains need to know the time to the second; an error of a minute in the time given by the watch of an engineer may cost him his position, possibly even his life. For astronomers, the matter is not quite so serious; relatively few of them are engaged in observations requiring precise times. The timing of immersions and emersions of stars occulted by the moon and the measurement of positions of rapidly moving asteroids or comets require accurate times in contrast to many other fields of observation.

For jewelers, railroad men, astronomers, and others requiring the correct time, the radio time announcements sponsored by the manufacturers of breakfast foods, patent medicines, beverages, etc., will not suffice. Even when the announcer solemnly assures one that "when the gong sounds, it will be *exactly* forty-one seconds after eight o'clock, Eastern Standard Time," one cannot depend on the seconds; sometimes even the minute or the hour is in error.

The railroads maintain in their offices, standard clocks which are compared daily with time signals transmitted by wire from the U. S. Naval Observatory. Their employees are expected to see to it that their watches agree with these standard clocks. Jewelers also arrange to receive time signals, either by wire or by radio, at regular intervals. How do astronomers determine the errors of their clocks? In the old days, it was customary for each observatory to make its own time observations and, in many cases, to serve as a local authority on time. Later, when time signals were broadcast by our Naval Observatory, many observatories installed radio sets in order to compare their clocks with those of the Naval Observatory. When it was found that these broadcast time signals could be depended upon, almost all of the observatories ceased to determine the time regularly from the stars and came to depend upon the radio signals.

When the various National Observatories first began to broadcast time signals, radio was a new thing and short-wave radio was yet a

thing of the future. Frequencies from about fifteen to one hundred fifty kilocycles were used and enormous amounts of energy were radiated. These frequencies are still used in many cases. Ordinary broadcast receivers will not receive these signals; for them, special equipment is necessary.

In recent years, short-wave radio has been coming into common use, not only for code but also for telephonic communication and, recently, for broadcasting programs. No longer is it considered remarkable to receive, with simple and inexpensive equipment, signals from very distant transmitters of relatively low power. In fact, it has become customary to construct ordinary radio sets so these short waves may be received on them. Such sets, commonly called "All-Wave Sets" or "Dual-Wave Sets," of excellent design and inexpensive, both in initial cost and in upkeep, are now available.

As the trend toward short waves continued, several of the National Observatories started sending their time signals out on these waves. No special equipment is needed to receive these signals; ordinary all-wave radios of standard make bring them in well. You need only to know when and on what frequencies to listen, and for what to listen. This information is given in detail in a publication of the U. S. Hydrographic Office, "Radio Aids to Navigation," commonly designated as H. O. No. 205. It is understood that a new edition of this book is to be issued early in 1935. Anyone purchasing a copy of it, is eligible to receive the supplementary notices which are issued at intervals. After the publication of a new edition, corrections are no longer issued for the obsolete edition.

For persons who do not have access to a copy of this valuable book, a small portion of the information contained therein, considerably condensed and supplemented by other information, will be presented here. It is to be understood that the schedule given at the end of the paper is not to be considered as necessarily complete, nor as permanent, but represents the best information available at the present. Through the courtesy of Rear Admiral W. R. Gherardi, Hydrographer of the U. S. Navy, the most recent information available at the Hydrographic Office when this article was written, is included.

Only three types of signals will be described here: the New American System, denoted by (A) in the schedule, the New International System, (I) in the schedule, and the Rythmic System, (R). Other types of signals will be denoted as Special, (S), and the reader is referred to "Radio Aids to Navigation" for further information concerning them. In the schedule, the letters, IR, under the Type of Signals means that signals of the New International Type are followed by signals of the Rythmic Type.

In the New American System, the signals usually continue for five minutes and end on the hour. The signals are dots at intervals of one second, with certain dots omitted for purposes of identification. In each of the five minutes, the dots corresponding to the 29th, 56th, 57th,

58th, and 59th seconds are omitted. Thus there is an interval of silence longer than one second before the 30th second and before the beginning of the minute. In addition, in the first minute, the signal corresponding to the 51st second is omitted; in the second minute, the dot corresponding to the 52nd second is omitted; in the third minute, the 53rd second; in the fourth minute, the 54th second; and in the last minute of signals, after the dot corresponding to the 50th second, there are no more signals until the long dash, the beginning of which marks the hour. It is seen that an isolated group of three dots followed by a silence of several seconds means that the next signal will be heard precisely at three minutes of the hour, while a long silence of ten seconds warns one that the next signal will be the long dash marking the hour. If this explanation seems complicated, a brief study of the spiral diagram in Figure 1 may help to clarify it. In this diagram, the successive signals

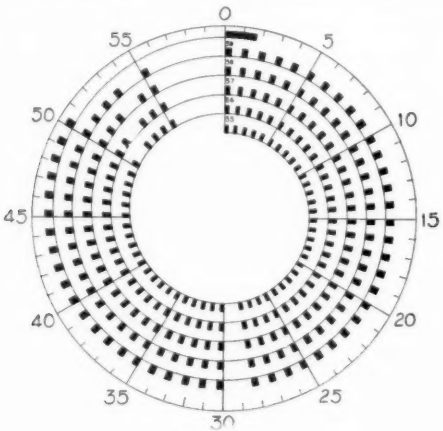

FIGURE 1.

are exhibited graphically on a spiral with one turn about the center for each minute. This type of diagram is used to good advantage in the "Anuario" of the National Observatory of Rio de Janeiro.

In the New International System, the signals last only three minutes and end on the hour. In the first minute, the letter X in the International Morse Code (a dash, two dots and a dash) is repeated every five seconds for fifty seconds; then there is a silence of six seconds followed by six dots separated by intervals of one second each. These dots are the time-signals and the sixth dot indicates two minutes of the hour. During the second minute, a series of N's (a dash followed by a dot) is sent. The dots occur on the 10th, 20th, 30th, 40th, and 50th seconds of the minute. Each dash lasts just one second and ends one second before the dot. From the 50th to the 55th second, there is silence; then there is another sequence of six dots, the sixth of which marks one

minute of the hour. During the last minute, a series of G's (two dashes followed by a dot) is sent, and again the dots mark the 10th, 20th, 30th, 40th, and 50th seconds. As previously, each dash lasts one second and the intervals of silence are one second in length. And from the 50th to the 55th second, there is silence. Then come six dots at second intervals with the sixth marking the hour. Again it may be convenient to refer to the spiral diagram in Figure 2 for clarification of this explanation. It

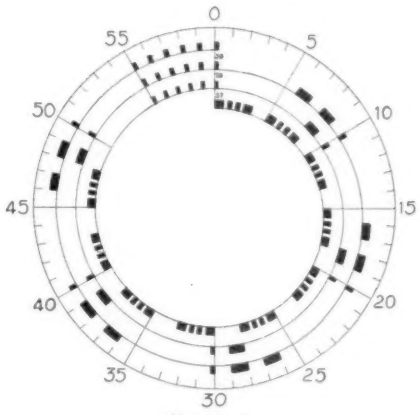

FIGURE 2.

should be mentioned that in the signals of certain observatories, each sequence of six dots is replaced by three dashes of one second duration each. Such observatories are using the Old International System.

In the Rythmic System, the signals usually start one minute after the hour and continue for five minutes. A dash and sixty dots are sent each minute, evenly spaced in time. Thus there is an interval of only 60/61 of a second between successive signals. The beginning of a dash marks the beginning of each minute. One can compare a chronometer or clock with second-beats with these signals to the nearest 1/61 of a second. One easily determines the error of the clock or chronometer to the nearest half-second by using the dash at the beginning of a minute. Then one determines the proper fraction of a second by using the principle of the vernier. One notes when the clock-beat coincides with the time-signal. If the clock were correct (or were in error by an integral number of seconds), the coincidence should come at the dash marking the beginning of the minute. If the clock were only a small fraction of a second fast, the coincidence would occur a few seconds after the beginning of each minute. If the clock were slow by a small fraction of a second, the coincidence would come a few seconds before the beginning of each minute.

It is unfortunate that the systems of time signals show such great variety. The elegant simplicity of the American System and the great

precision of comparison afforded by the Rythmic System recommend these two systems above all others in the estimation of the author. An ideal broadcast of time signals would consist of American type signals for five minutes before the hour, and five minutes of Rythmic signals, beginning one minute after the hour.

Besides the signals listed below, special mention should be made of those sent out by the short-wave stations of the British Broadcasting Company, GSA, GSB, GSC, GSD, GSE, and GSF. Several times a day, six dots are broadcast at second-intervals; the sixth dot marks an hour, a half-hour or one of the quarter-hours. The Royal Observatory at Greenwich is the source of these time signals so they may be relied upon to be accurate. One difficulty encountered in the use of these signals is that sometimes, (not always), when a program is in progress, the six dots are suppressed on aesthetic grounds. In such a case, they may be broadcast a quarter of an hour later, or may possibly be omitted entirely. Another difficulty which may be encountered and which may cause considerable confusion is the fact that many times programs broadcast during the day in London are electrically recorded and relayed by short-wave in the evening for listeners in the distant parts of the British Empire. In these electrically recorded programs, the six dots may happen at any time during the hour, and one may not learn that they are not authoritative time signals until the announcer mentions the fact, perhaps an hour later.

Also, in the summer, the times for these signals are changed when Great Britain goes on "Summer Time." One notices that "Summer Time" in Great Britain does not begin and end with "Daylight Saving Time" in the United States. But the difference is not so great as between the United States and Argentina. The difference in the seasons in the two hemispheres is presented forcibly when it is noticed that Argentina is just going on Summer Time in September when the United States is about ready to give it up, and they relinquish it about the last of March when we are getting ready to adopt it.

Mention should be made of certain time signals which are available on a few American broadcasting stations and which, while not as precise as those of the National Observatories, are seldom in error by more than two seconds. These are the superimposed tone beats which one hears every hour on the hour over such stations as the Westinghouse Stations, WBZ, WBZA, KDKA, and their associated short-wave stations.

Anyone who has used a modern radio set in receiving programs on short-waves knows that automatic volume control has eliminated much of the trouble that used to be caused by "fading." The very interesting skip-distance effect may prevent the reception of certain stations. It may be that European stations will be heard to good advantage while stations only a few hundred miles away will not be heard at all. Man-made static, caused by electric motors, automobile ignition systems, street cars, etc., cause much more trouble in short-wave reception than

with reception on the ordinary broadcasting band, but the natural static of thunderstorms, etc., does not seem to interfere so much with short waves as with longer ones. In fact, one may say that in any location that would be highly desirable as a site for an observatory one would probably have excellent reception on short-waves.

In conclusion, it may be well to point out that with many receivers of the superheterodyne type, certain time signals are heard to much better advantage if the tone-control is adjusted to favor the high notes rather than the low ones. If the reader feels inclined to listen for the signals listed below, he may rest assured that he does not need to know the telegraphic code.

Eastern Standard Time	Signals from	Call Letters	Frequency (K.C.)	Type Signals
0055-0106	U. S. S. R.	RKD	10657	SR?
0255-0300	Washington, D. C.	NAA	9050	A
0255-0300	San Francisco, Calif.	NPG	8590	A
0255-0300	Honolulu, P. I.	NPM	8090	A
0257-0306	Paris, France	FYB	10580	IR
0354-0400	Shanghai, China	FFZ	8333	I
0354-0400	Shanghai, China	FFZI	8220	I
0354-0400	Shanghai, China	8ZW	12295	I
0500-0517	Monsanto, Portugal	CTV	11539	S
0500-0517	Monsanto, Portugal	CTV	9090	S
0525-0530	Tsingtao, China	XORT	7140	S
0645-0650	Monte Grande, Argentina	LSD	8830	R
0655-0706	Norddeich, Germany	DAN	11340	IR
0655-0706	Konigs Wusterhausen, Germany	DJB	15200	IR
0755-0800	Cavite, P. I.	NPO	9050	A
0855-0900*	Elgin, Illinois	W9XAM	4798	A
0854-0900	Buenos Aires, Argentina	LOL	8690	I
0855-0906	U. S. S. R.	RKD	10657	SR?
0955-1000*	Elgin, Illinois	W9XAM	4798	A
1055-1100*	Elgin, Illinois	W9XAM	4798	A
1055-1106	U. S. S. R.	RKD	10657	SR?
1155-1200	Washington, D. C.	NAA	8410	A
1155-1200	Washington, D. C.	NAA	12615	A
1155-1200	Washington, D. C.	NAA	16820	A
1155-1200	San Francisco, Calif.	NPG	12885	A
1155-1200	Honolulu, P. I.	NPM	8090	A
1155-1206	U. S. S. R.	RIM	7626	SR?
1252-1300	Massawa, Eritrea	IRG	5454	S
1255-1300*	Elgin, Illinois	W9XAM	4798	A
1350-1400	Saigon, French Indo-China	FZR	9620	R
1355-1400	La Punta, Peru	OBE	13043	A
1455-1500†	Elgin, Illinois	W9XAM	4798	A
1457-1506	Paris, France	FYB	10580	IR
1555-1600	Washington, D. C.	NAA	9050	A
1702-1710	Mogadiscio, Italian Somaliland	ISG	5450	S
1845-1850	Monte Grande, Argentina	LSD	8830	R
1845-1855	Monte Grande, Argentina	LQC	17660	R
1855-1900	Washington, D. C.	NAA	9050	A
1855-1906	Norddeich, Germany	DAN	11340	IR
1855-1906	Konigs Wusterhausen, Germany	DJA	9560	IR
1855-1920	Rio de Janeiro, Brazil	PPE	8721	IRS
1925-1930	Tsingtao, China	XORT	7140	S

* Daily, except Sunday. † Saturday and Sunday. ‡ Sunday only.

Eastern Standard Time	Signals from	Call Letters	Frequency (K.C.)	Type Signals
1957-2000	Malabar, Java	PLO	11440	I
2054-2100	Buenos Aires, Argentina	LOL	8690	I
2154-2200	Shanghai, China	FFZ	8333	I
2154-2200	Shanghai, China	FFZI	8220	I
2154-2200	Shanghai, China	8ZW	12295	I
2155-2200	Washington, D. C.	NAA	9050	A
2155-2200	San Francisco, Calif.	NPG	12885	A
2155-2200	Honolulu, P. I.	NPM	16180	A
2153-2200	Kien an, French Indo-China	FRK	8570	S
2255-2300‡	Elgin, Illinois	W9XAM	4798	A
2325-2330	Cavite, P. I.	NPO	8872	A
2325-2330	Cavite, P. I.	NPO	17744	A
2355-2400	Washington, D. C.	NAA	4525	A

Planet Notes for April, 1935

By CLIFFORD E. SMITH

NOTE: All times, unless otherwise stated, are Central Standard Time.

The *Sun* will be moving with an apparent northeasterly motion from the central part of Pisces to the central part of Aries. At the beginning of the month its distance from the earth will be about 92.8 million miles and this distance will increase about three quarters of a million miles during the month. The position of the sun on the first and last days of the month will be, respectively: R.A. $0^h\ 38^m$, Decl. $+4°\ 6'$; and R.A. $2^h\ 25^m$, Decl. $+14°\ 25'$.

The phenomena of the *Moon* will occur as follows:

New Moon	April	3 at	6 A.M.
First Quarter		10 "	12 M.
Full Moon		18 "	3 P.M.
Last Quarter		25 "	10 P.M.
Apogee		13 "	2 P.M.
Perigee		1 "	2 P.M.
Perigee		29 "	10 A.M.

Mercury, at the beginning of the month, will be a morning object in southwestern Pisces, rising about an hour before the sun. Its position on April 1 will be, R.A. $23^h\ 18^m$, Decl. $-7°\ 9'$. Its distance from the earth on the first of the month will be about 106 million miles, and its apparent diameter will be about 5.8 seconds of arc. At the end of the month it will be near the sun in apparent position in central Pisces. Superior conjunction will occur on April 27 at 6:00 A.M. Conjunction with the moon will occur on April 1 at 9:00 P.M. (Mercury 7°0 S).

Venus will be moving with an apparent easterly motion from the central part of Aries to the eastern part of Taurus. Its distance from the earth will decrease from about 125 to about 110 million miles, and the apparent diameter will change from about 12.4 to about 14.3 seconds of arc. During this period it will set about two hours after the sun. Venus will be in conjunction with the moon on April 5 at 6:00 P.M. (Venus 4°2 S).

Mars will be in the most favorable position for observation during this apparition in April. It will be visible practically all night long in central Virgo. Opposition with respect to the sun will occur at noon on April 6. On April 11 at 11:00 P.M. Mars will be nearest the earth for this apparition. Its distance will be about 58 million miles. The apparent diameter of Mars, at the time of its

nearest approach, will be about 15 seconds of arc. Conjunction with the moon will occur on April 17 at 2:00 P.M. (Mars 7°.8 N).

Jupiter will be a night object in central Libra. During the middle of the month it will be toward the south (on the meridian) about 2:00 A.M. local time. Its distance from the earth will be about 420 million miles, and its apparent diameter will be about 41 seconds of arc. Conjunction with the moon will occur on April 20 at 1:00 P.M. (Jupiter 6°.0 N). Its apparent motion in the sky during this period will be retrograde.

Saturn will be a morning object in central Aquarius, and, during the latter part of the month, it will rise about two hours before the sun in the northern hemisphere. Its distance from the earth will be about 970 million miles, and its apparent diameter will be about 14 seconds of arc. Conjunction with the moon will occur on April 28 at 9:00 A.M. (Saturn 5°.4 S).

Uranus will be too near the sun in apparent position to be of interest this month. Conjunction with the sun will occur on April 22 at 6:00 A.M.

Neptune will be a night object in Leo about a degree west of χ Leonis, and it will set about 3:00 or 4:00 in the morning, local time. Its position on April 16 will be R.A. $10^h\ 56^m$, Decl. $+7°\ 54'$. The distance from the earth to Neptune will be about 2700 million miles, and the apparent diameter of Neptune will be about 2½ seconds of arc. Its apparent motion in the sky will be retrograde. Conjunction with the moon will occur on April 15 at 1:00 A.M. (Neptune 5°.0 N).

OCCULTATION PREDICTIONS

(Taken from the *American Ephemeris.*)

Date 1935		Star	Mag.	Immersion: Greenwich C.T.	Immersion: *a*	Immersion: *b*	Immersion: Angle E from N	Emersion: Greenwich C.T.	Emersion: *a*	Emersion: *b*	Emersion: Angle E from N
				h m	m	m	°	h m	m	m	°
Occultations Visible in Longitude +72° 30′, Latitude +42° 30′.											
Apr.	6	η Tau	3.0	17 1.2	−0.4	+3.0	30	17 58.6	−2.1	−0.2	290
	11	θ Cnc	5.6	22 33.7	−2.7	+2.8	65	23 27.8	−0.8	−4.0	348
	23	4 G.Sgr	6.2	8 44.2	−2.3	−1.2	137	9 33.1	−1.2	+1.0	210
	28	186 B.Aqu	6.2	7 57.5	−0.4	+2.4	20	8 41.9	−0.8	+1.0	288
Occultations Visible in Longitude +91° 0′, Latitude +40° 0′.											
Apr.	6	η Tau	3.0	17 2.6	..	..	348	17 12.7	..	..	331
	11	85 Gem	5.4	7 10.5	+1.2	−3.2	179	7 31.1	−0.3	+0.2	224
	21	*A* Sco	4.7	10 24.8	−1.5	−1.0	91	11 40.9	−1.1	−1.4	278
	21	3 Sco	5.9	11 3.8	−1.0	−0.6	68	12 9.4	−1.2	−2.0	299
	23	4 G.Sgr	6.2	8 13.1	..	..	147	8 57.3	..	..	212
Occultations Visible in Longitude +120° 0′, Latitude +36° 0′.											
Apr.	16	431 B.Leo	6.2	3 53.2	..	..	62	4 23.3	..	..	17
	21	*A* Sco	4.7	9 27.0	−2.2	−0.1	104	10 56.2	−2.2	−0.8	284
	21	3 Sco	5.9	10 9.4	−2.5	+0.4	71	11 26.8	−2.1	−1.7	312
	24	162 B.Sgr	6.6	12 34.7	−2.4	−0.1	99	13 50.4	−1.5	+0.7	226

Variable Stars

Monthly Report of the American Association of Variable Star Observers for January, 1935

The Nova in Hercules has incited many dormant observers to renewed action. More than 500 observations were received during January from A.A.V.S.O. ob-

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

Nov. 0 = J.D. 2427742; Dec. 0 = J.D. 2427772; Jan. 0 = J.D. 2427803.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
S Scl			T And			Y Cep			— Cas			U And			RU And		
001032			001726			003179			004746b			010940			013238		
753	6.4	Bl	805	8.8	Jo	802	9.5	Gy	773	10.8	Pf	802	11.8	Hk	802	11.9	Ar
763	7.0	Bl	808	8.9	Jo	807	9.4	Gy	798	11.0	Pt	802	11.6	Gy	802	11.3	Gy
767	7.5	Ht	814	8.8	Ie	807	9.5	Ie	W Cas			806	11.6	B	802	11.2	Ma
772	7.2	dK	815	9.0	Wd	808	9.4	Jo	004958			807	11.8	Gy	802	11.4	Hk
778	7.8	dK	T Cas			U Cas			775	12.0	Ch	814	11.9	Bs	804	12.1	Wu
784	7.9	dK	001755			004047a			776	11.3	Fr	UZ And			806	11.4	B
787	8.6	Ht	756	8.7	Ch	773	9.0	Pf	783	11.2	Fr	011041			806	12.3	Bs
790	8.0	dK	783	10.4	Hf	775	9.8	Hi	784	11.1	Fr	801	15.0	Ar	814	12.3	Ie
794	8.9	Ht	785	10.6	Jo	775	9.2	Ch	784	11.3	Af	802	15.1	Ar	Y And		
795	8.1	dK	785	9.6	B	780	10.0	Wg	785	11.3	Af	S Psc			013338		
796	8.5	Kd	789	11.1	Gy	783	10.0	Hf	785	11.3	Fr	011208			639	9.0	Fc
798	9.0	Kd	792	10.6	Hf	788	10.8	Bs	785	11.6	Jo	798	11.0	Bj	659	9.7	Fc
803	8.1	Kd	792	10.5	Sh	794	11.3	Sx	794	11.2	Ra	802	11.0	Mw	667	10.2	Fc
806	9.4	Kd	792	10.6	Wd	796	10.8	Hi	795	11.4	Fr	S Cas			800	13.2	Ch
808	9.4	Kd	794	10.8	Ra	797	10.7	Sf	798	12.5	Pt	011272			802	12.7	Ar
X And			798	10.0	Ch	798	10.5	Pt	799	12.1	Ch	776	13.8	Ch	802	12.9	Ma
001046			798	10.8	Pt	799	10.7	Ch	801	11.8	Fr	799	13.1	Ch	X Cas		
798	13.3	Ch	800	10.5	Wh	800	11.0	Hi	801	11.8	Dh	802	13.1	Pf	014958		
802	12.8	Ar	802	10.3	Mw	802	10.7	Hu	802	12.0	Hk	802	12.9	Ie	640	11.0	Fc
806	12.7	Ie	802	10.8	Hk	802	10.0	Hk	803	11.3	B	804	13.0	Pt	644	11.8	Fc
807	12.4	B	802	11.1	Gy	803	11.9	Ra	804	12.0	My	807	12.9	Wa	656	11.8	Fc
T Cet			804	10.4	My	804	10.5	Wh	814	11.3	Jo	807	13.0	Wp	660	11.7	Fc
001620			805	10.9	Hf	805	11.2	Hf	814	11.5	Wd	U Psc			802	11.8	Fr
792	6.3	Lt	806	10.9	B	807	11.4	Sf	U Tuc			011712			802	11.8	Hk
797	6.5	Kd	807	11.1	Gy	814	11.3	Ie	*005475*			766	12.8	Ch	802	11.6	Wu
798	6.5	Kd	814	11.0	Jo	RW And			745	8.5	Sl	790	10.7	Lg	804	12.6	Pt
802	6.6	Lt	814	10.9	Wd	004132			753	8.2	Bl	800	10.7	Ch	806	12.0	Bs
803	6.4	Kd	R And			774	13.1	Ch	763	8.5	Bl	802	11.1	Gy	814	11.7	Jo
805	6.6	Lt	001838			798	13.0	Pt	767	9.2	Ht	804	11.0	Pt	U Per		
808	6.4	Kd	773	13.0	Ch	V And			787	9.9	Ht	R Scl			015254		
809	6.4	Kd	788	12.9	Bs	004435			Z Cet			*012233a*			656	8.4	Fc
T And			798	12.4	Pt	779	10.2	Ch	*010102*			798	7.9	Kd	660	8.5	Fc
001726			802	12.4	Ma	793	8.9	Es	753	10.6	Wg	803	8.0	Kd	756	10.8	Ch
756	9.4	Ch	815	12.6	Wd	800	8.7	Ch	774	9.1	Ch	806	7.9	Kd	757	11.0	Cy
775	9.1	Hi	S Tuc			801	9.8	Fr	775	9.3	Hi	808	8.1	Kd	773	11.2	Fi
777	8.5	Mo	*001862*			806	9.1	B	781	9.1	Hf	RZ Per			779	11.1	Ry
783	9.0	Hf	753	10.8	Bl	814	8.9	Jo	790	8.6	Jo	012350			781	10.2	Sq
788	8.8	Bs	763	11.5	Bl	X Scl			795	9.0	Sx	756	9.4	Ch	783	11.2	Ch
789	8.9	B	767	12.7	Ht	*004435*			800	8.7	Ch	801	10.6	Ch	783	11.1	Ry
792	8.8	Sh	772	11.9	dK	753	13.0	Bl	800	8.8	Hi	802	10.6	Gy	796	10.6	Ry
792	8.9	Hf	S Cet			763	12.0	Bl	801	8.7	Jo	806	10.3	B	804	10.6	My
792	8.8	Wd	*001909*			RR And			802	9.0	Fr	807	10.6	Gy	804	10.5	Pt
793	8.6	Es	766	13.9	Ch	004533			802	8.8	Hi	814	11.0	Bs	805	10.6	Hf
795	8.5	Lt	796	11.7	Hi	775	13.3	Ch	804	8.3	Pt	R Psc			806	10.2	B
796	8.8	Hi	798	11.4	Pt	800	13.3	Ch	805	8.9	Jo	012502			808	9.8	Jo
798	8.7	Pt	799	11.5	Ch	RV Cas			806	9.1	Hf	657	7.7	Fc	814	9.6	Jo
798	8.4	Ch	803	11.4	Sp	004746a			807	8.8	Hz	750	11.6	Fn	815	10.0	Ba
800	9.0	Ra	806	11.3	Ie	773	12.0	Pf	808	9.1	Jo	776	11.8	Ch	XX Per		
801	8.5	Fr	T Phe			775	12.1	Ch	U Scl			801	13.0	Ch	015654		
801	8.7	Hi	*002546*			783	12.7	Ar	*010630*			807	12.9	Gy	756	8.4	Ch
801	8.5	Jo	767	13.0	Ht	784	12.4	Ar	753	10.3	Bl	RU And			783	8.2	Ch
802	8.6	Lt	Y Cep			785	12.7	Ar	763	10.1	Bl	013238			788	8.4	Lt
802	8.8	Gy	003179			799	13.2	Ch	U And			639	13.0	Fc	803	8.4	Lt
803	8.7	Jo	776	12.1	Ch	801	13.4	Ar	010940			659	13.0	Fc	811	8.4	Lt
804	8.2	Mo	795	10.5	Ch	802	13.1	Ar	756	9.6	Ch	667	13.0	Fc	S Ari		
805	8.5	Lt	797	10.3	Sf	807	13.4	B	800	11.2	Ch	782	10.5	Ch	015912		
805	9.0	Hf	801	9.7	Jo				802	11.4	Ie	800	11.6	Ch	802	12.0	Gy

Variable Star Observations Received During January, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R Ari			**Z Cep**			**o Cet**			**o Cet**			**o Cet**			**S Per**		
021024			021281			*021403*			*021403*			*021403*			021558		
639	8.4	Fc	776	13.7	Ch	789	3.3	Jo	799	2.3	Rb	806	2.8	Kd	789	9.4	Hf
653	7.8	Fc	802	12.5	Gy	789	3.6	Ch	799	2.7	Si	806	2.5	Wd	795	9.3	Af
756	13.0	Ch	807	14.2	Ie	789	3.0	Rb	799	2.6	Hq	807	2.5	Cy	795	9.2	Sx
774	12.6	Ch	**o Cet**			790	3.0	Rb	800	2.5	Sx	807	2.2	Rb	795	9.3	Fr
783	11.7	Fr	*021403*			790	3.5	Hm	800	3.1	Ad	807	2.7	Hm	798	9.9	Fr
784	11.4	Fr	749	6.6	Cy	792	3.0	Rb	800	2.7	Hm	808	2.7	Mh	798	9.2	Pk
784	11.3	Af	750	6.9	Fn	792	2.8	Sh	800	2.7	Hb	808	2.4	Ba	801	10.0	Fr
795	10.2	Dh	752	6.3	Ch	792	2.6	Wd	800	2.0	Hu	808	2.7	Dl	802	9.6	Gy
797	10.1	Ch	753	6.5	Fn	792	2.6	Si	800	2.8	Mc	808	2.7	Hm	802	9.9	Wd
800	10.1	Sx	756	6.0	Ch	792	2.7	Mh	801	3.0	Bu	808	3.0	Jo	803	9.3	Ra
802	9.4	Hz	757	5.8	Cy	792	3.5	Hm	801	2.6	Hv	808	2.5	Cy	804	9.0	My
802	10.1	Ma	766	4.6	Pm	792	2.8	Hf	801	2.5	Dh	808	2.7	Kd	804	8.9	Pt
804	9.6	Pt	767	5.1	Ch	792	3.0	Kg	801	2.7	Dl	808	2.2	Rb	805	9.2	Dl
805	9.9	Hf	770	5.0	Ch	793	3.2	Ch	801	2.5	Fr	810	3.0	Mw	805	9.3	Cm
805	9.6	Jo	773	4.9	Ch	793	2.5	Si	801	2.6	Hk	812	2.8	Hb	805	9.3	Hf
807	10.1	Fd	773	4.6	Si	794	2.9	Ra	801	2.7	Hm	814	2.8	Hm	807	9.0	Cy
808	9.3	Jo	773	4.6	By	794	2.8	Sf	801	2.6	Kd	814	2.8	Dl	807	9.3	Dl
814	9.0	Jo	773	4.4	Fn	794	2.5	Si	802	2.8	Mh	814	2.9	Ba	808	8.9	Jo
814	9.4	Wh	775	4.2	Cy	794	2.9	Ad	802	2.6	Bc	814	3.0	Ad	814	9.2	Dl
814	9.0	Sh	775	4.7	Pm	794	2.5	Fn	802	2.5	Dh	814	2.9	Cy	814	8.8	Jo
W And			775	4.3	Si	794	2.8	Dl	802	2.4	Fr	814	3.0	Wd	814	9.2	Cy
021143a			775	4.2	Sd	795	2.7	Mh	802	2.7	Hm	814	2.7	Sx	815	9.6	Dl
639	11.4	Fc	776	4.6	Ch	795	3.0	Ad	802	2.4	Hu	815	2.8	Dl	**R Cet**		
653	10.3	Fc	776	4.2	Si	795	2.5	Ar	802	2.5	Kg	815	2.9	Hm	*022000*		
659	9.7	Fc	776	4.2	Sd	795	2.6	Af	802	2.5	Lf	818	3.1	Sp	653	9.5	Fc
667	8.8	Fc	777	4.4	Pm	795	2.8	Hv	802	2.4	Mw	**S Per**			657	8.5	Fc
756	8.9	Ch	777	4.0	Si	795	3.0	Bc	802	2.8	O	021558			774	12.9	Ch
764	9.0	Ch	777	4.1	Hk	795	2.6	Dh	802	2.6	Pb	640	9.1	Fc	775	12.7	Hi
774	9.4	Ch	777	4.2	Fn	795	2.5	Fr	802	2.7	Pm	653	9.1	Fc	785	12.6	Ch
789	9.9	Hf	777	4.0	Sd	795	2.5	Ra	802	2.6	Ch	656	9.2	Fc	796	11.3	Hi
797	9.9	Ch	781	4.2	Hf	795	2.7	Sx	802	2.6	Ra	659	9.1	Fc	797	10.0	Kd
800	10.3	Bj	782	3.8	Si	796	2.6	Ch	802	2.3	Rb	660	9.0	Fc	798	10.9	Sp
802	10.7	Gy	782	3.5	Ar	796	2.7	Rb	802	2.6	Si	667	8.9	Fc	802	10.5	Hi
802	10.5	Hk	782	3.5	Fn	796	2.8	Hv	803	2.7	Kd	737	9.4	Cy	802	10.3	Mw
803	10.5	Ra	782	3.5	Dh	796	3.1	Hm	803	2.6	Ra	741	9.4	Cy	802	10.5	Ch
804	10.1	Pt	783	3.9	Ch	796	3.4	Jo	803	2.5	Sx	757	9.2	Cy	804	10.6	My
805	10.5	Hf	783	3.7	Si	796	3.0	Kd	803	3.2	Ad	769	9.2	Cy	805	10.5	Hf
814	10.9	Bs	783	3.3	Ar	797	3.0	O	803	2.9	Bu	773	9.2	Fn	806	9.4	Jo
T Per			783	3.3	Af	798	2.4	Rb	803	2.7	Hm	773	9.3	Pk	806	10.3	Wd
021258			783	3.4	Fn	798	2.5	Wd	803	2.5	Hu	773	9.2	Si	807	10.4	Hz
773	8.8	Fn	783	4.1	Bu	798	2.6	Si	803	2.7	Jo	775	9.1	Cy	810	10.0	Mw
773	8.8	Si	783	3.3	Fr	798	2.6	By	804	2.8	Bu	775	8.9	Pk	**RR Per**		
777	8.9	Si	784	3.4	Si	798	2.8	Ar	804	2.7	Hm	776	9.3	Fr	022150		
780	8.7	Sq	784	3.3	Af	798	2.7	Hv	804	2.8	O	777	9.4	Af	653	13.2	Fc
789	8.8	Hf	784	3.3	Fn	798	2.4	Fr	804	2.5	Pt	777	9.3	Si	667	13.2	Fc
795	9.3	Lt	784	3.2	Dh	798	2.7	Gy	804	2.2	Rb	780	8.8	Fs	756	11.6	Ch
795	8.5	Sx	784	3.3	Fr	798	2.9	Sp	805	2.8	Bu	780	8.4	Sq	783	10.1	Ch
802	9.3	Wd	785	3.2	Ar	798	3.2	Hm	805	2.8	Dl	781	9.4	Pk	802	10.1	Hf
803	8.8	Ra	785	3.2	Af	798	2.5	Hu	805	2.7	Hm	782	9.4	Af	803	10.2	Ra
804	9.1	Lt	785	3.2	Dh	798	3.0	Kg	805	2.7	Hf	783	9.3	Fr	804	9.7	Pt
804	8.7	Pt	785	3.2	Fr	798	2.8	Kd	805	2.2	Rb	784	9.3	Fr	813	10.0	Cm
805	8.9	Hf	785	3.4	Kd	798	2.7	Pb	805	2.7	Sf	784	9.4	Dh	**R For**		
808	8.5	Jo	786	3.4	Ra	799	2.7	Hv	806	2.7	Mh	784	9.4	Af	*022426*		
808	8.8	Dl	786	3.4	Sx	799	2.8	Dl	806	2.6	Ba	785	9.4	Af	753	12.7	Bl
814	9.0	Dl	788	3.2	O	799	2.5	Fs	806	2.8	Bu	785	9.5	Dh	773	13.0	Ch
814	8.5	Jo	789	2.9	Dl	799	2.8	Hm	806	2.8	Hm	785	9.5	Hk	798	12.5	Bj
815	9.2	Dl	789	3.7	Hm	799	2.7	Pm	806	2.2	Rb	785	9.3	Fr			
			789	3.0	Hf	799	2.6	Ch	806	2.4	Kg	787	9.1	Dl			

Variable Star Observations Received During January, 1935.

J.D. Est. Obs.

U Cet
022813
657 9.2 Fc
771 13.4 Ch
773 13.3 Ch
798 11.1 Bj
798 11.7 Sp
799 11.9 Cm
800 11.8 Ch
802 11.2 Mw
802 11.4 Hk
802 11.3 Fr
804 11.5 Pt
805 11.0 Jo
805 11.1 Hf
806 11.1 Hf
808 10.8 Jo
810 10.2 Mw
812 11.0 Hb
815 9.8 Wd

RR Cep
022980
801 13.2 Ch
802 12.7 Gy
807 13.2 Ie

R Tri
023133
653 8.5 Fc
756 11.7 Ch
774 10.0 Ch
783 9.6 Af
785 9.7 Dh
785 9.6 Hk
789 9.3 Hf
795 8.9 Sx
797 8.8 Sf
797 8.7 Ch
800 8.9 Bj
801 9.0 Mw
802 8.7 Mw
802 9.0 Gy
802 8.4 Ma
803 8.6 Ra
804 8.0 Pt
805 8.4 Hf
806 8.6 Mw
807 8.2 Fd
808 8.3 Jo
810 8.2 Mw
812 8.2 Mw
814 8.0 Jo
814 7.7 Pv

T Ari
024217
653 10.5 Fc
716 10.7 Fc
756 8.8 Ch
773 9.6 Wg
774 8.6 Ch
776 9.6 Pb
776 9.7 Fr
777 8.9 Si
780 9.0 Wg
783 9.6 Dh
783 9.6 Fr
784 9.6 Fr
784 9.5 Af
784 9.6 Dh
785 9.4 Dh
785 9.3 Af
785 9.5 Fr
787 8.9 Jo
795 9.0 Sx
802 9.6 Hu
803 8.7 Jo
806 9.6 Hf
806 9.8 Bs
808 8.6 Jo
814 9.1 Pv
815 8.7 Jo

W Per
024356
653 9.2 Fc
656 9.3 Fc
660 9.2 Fc
667 9.2 Fc
757 9.9 Cy
756 9.4 Ch
774 9.3 Ch
775 10.3 Cy
776 10.3 Fr
777 10.4 Af
779 9.9 Ry
782 9.7 Hv
782 10.3 Dh
783 10.3 Af
783 10.3 Fr
783 9.6 Ry
784 10.2 Af
784 9.5 Hv
784 10.2 Dh
784 10.1 Fr
785 10.1 Fr
785 9.9 Hk
785 10.2 Af
785 9.6 Hv
785 10.0 Dh
786 9.1 Ra
787 9.4 Jo
789 9.4 Hf
795 10.1 Af
795 9.5 Hv
795 10.0 Fr
796 9.4 Jo
796 9.4 Ry
798 10.0 Fr

W Per
024356
798 10.0 Dh
801 9.9 Dh
801 9.9 Fr
802 10.2 Sx
803 9.2 Wh
804 9.1 My
804 10.1 Pt
805 9.4 Hf
807 9.8 Cy
807 9.5 Fd
808 9.3 Jo
812 9.2 Hb
814 9.3 Jo

R Hor
025050
745 7.4 Sl
753 8.0 Bl
763 8.9 Bl
767 9.4 Ht
772 8.9 dK
778 9.1 dK
784 9.7 dK
785 9.8 En
787 10.2 Ht
790 9.7 dK
792 10.3 En
795 10.0 dK

T Hor
025751
767 12.4 Ht

U Ari
030514
653 8.6 Fc
717 11.7 Fc
756 12.9 Ch
774 13.3 Ch
802 12.2 Gy

X Cet
031401
716 9.5 Fc
750 8.7 Fn
756 8.6 Ch
774 9.4 Ch
777 9.4 Fn
783 9.8 Fn
787 10.5 Jo
791 10.8 Bs
795 10.7 Sx
797 11.0 Sf
798 11.2 Bj
798 11.2 Sp
799 11.0 Jo
802 11.3 Gy
802 11.1 Hu
802 11.4 Mw
803 11.4 Jo
804 11.6 Pt
804 11.3 My

X Cet
031401
806 11.3 Wa
808 11.4 Jo
810 11.9 Mw
812 12.1 Mw
814 11.9 Jo

Y Per
032043
716 10.2 Fc
756 9.2 Ch
775 8.7 Pk
776 8.8 Pk
780 8.3 Sq
782 9.0 Hv
783 9.0 Hv
783 8.8 Ch
784 9.0 Hv
785 8.9 Hv
785 9.3 Af
785 9.3 Fr
787 8.7 Jo
789 9.2 Hf
791 8.3 Bs
795 8.9 Hv
800 8.6 Sx
802 8.9 Mc
803 9.1 Ra
804 8.1 Wh
804 8.3 Pt
805 9.1 Hf
808 8.6 Jo
814 8.5 Jo
814 8.5 Pv

R Per
032335
653 11.7 Fc
656 11.5 Fc
667 11.6 Fc
717 9.0 Fc
756 11.8 Ch
774 13.2 Ch
791 12.1 Bs
802 14.2 Ma
804 13.4 My

Nov Per
032443
656 12.6 Fc
770 13.0 Ar
782 12.8 Ar
783 13.0 Ar
784 13.0 Ar
785 13.0 Ar
795 13.2 Ar
801 13.0 Ar
802 13.0 Ar
804 13.1 Pt

U Cam
033362
757 8.0 Cy
777 8.0 Si
783 8.3 Hf
787 7.7 Jo
790 7.7 Jo
803 7.6 Jo
805 8.2 Hf
807 8.1 Cy
808 7.5 Jo
814 8.1 Cy

U Eri
034625
773 9.0 Ch
806 10.4 Mw
810 10.7 Mw

X Per
034930
787 6.2 Lt
795 6.4 Lt
802 6.3 Lt
802 6.0 Mc
811 6.3 Lt

T Eri
035124
772 10.9 Ch
798 11.7 Sp
798 12.0 Bj
811 12.0 Bj

W Eri
040725
773 12.9 Ch
806 10.9 Mw
810 10.8 Mw

R Tau
042209
656 13.5 Fc
671 13.9 Fc
769 11.9 Ch
775 12.0 Hi
782 11.6 Ar
783 11.5 Ar
783 11.2 Af
783 11.2 Fr
784 11.0 Hk
784 11.3 Ar
785 11.1 Ar
785 11.0 Hk
786 10.9 B
791 10.2 Bs
794 9.8 Ra
796 9.8 Hi
800 9.7 Hi
800 10.2 Ch
802 9.9 Gy
802 9.6 Ar
802 9.8 Ma
802 9.9 Hf
803 9.5 B
804 10.0 Pt

R Tau
042209
805 9.9 Jo
806 10.1 Cm
808 9.3 Jo
815 8.7 Jo

W Tau
042215
656 10.4 Fc
660 10.4 Fc
671 10.2 Fc
716 10.2 Fc
757 10.2 Cy
769 10.8 Ch
775 10.6 Cy
776 10.5 Dh
776 10.7 Fr
782 10.9 Ar
782 10.4 Dh
783 10.7 Fr
784 10.6 Fr
784 10.5 Af
784 10.5 Dh
784 10.8 Hk
785 10.6 Fr
785 10.6 Af
785 10.5 Dh
785 10.9 Hk
785 10.5 Jo
786 10.6 B
789 11.1 Rb
790 10.7 Jo
795 10.7 Fr
795 10.9 Dh
795 10.6 Af
795 11.0 Ar
798 10.7 Fr
798 10.9 Sp
800 11.8 Ch
801 11.0 Po
801 10.7 Fr
801 10.7 Dh
802 10.7 Dh
802 10.7 Fr
802 11.0 Hf
803 11.0 B
803 10.6 Jo
804 10.8 My
804 11.1 Pt
807 10.7 Cy
807 10.1 Fd
808 10.5 Jo
812 11.0 Sp
814 10.8 Pv
815 10.4 Jo
815 10.8 Ba

S Tau
042309
671 11.7 Fc
775 13.2 Hi

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
S TAU			X CAM			AB AUR			R LEP			S PIC			S AUR		
042309			043274			044930			*045514*			*050848*			052034		
782	13.6	Ar	781	12.5	Pk	811	6.9	Lt	806	8.9	Wd	767	11.0	Ht	786	9.9	Ch
783	14.0	Ar	782	12.6	Pk	R ORI			807	8.6	Dl	R AUR			786	10.2	Ra
785	13.6	Ar	798	12.4	Pk	045307			807	7.8	Hm	050953			787	9.2	Jo
784	13.6	Ar	799	12.1	Ch	656	13.6	Fc	808	8.6	Dl	660	8.9	Fc	787	9.7	Dl
800	13.5	Ch	804	11.3	Pt	671[	13.4	Fc	814	8.6	Dl	671	9.0	Fc	789	9.0	B
802	14.0	Ar	804	11.3	My	774	10.9	Ch	814	7.6	Hb	774	13.2	Ch	789	10.2	Gy
806[	12.8	Cm	805	11.3	Hf	785	9.9	Fr	815	7.4	Jo	776	13.3	Hk	789	9.6	Rb
T CAM			813	11.0	Bs	785	10.1	Hk	815	8.6	Wd	776	13.1	Pb	796	9.4	Jo
043065			R DOR			786	9.5	B	815	8.3	Hm	799	13.4	Ch	797	9.3	Ch
774	8.6	Ch	*043562*			796	9.6	Jo	815	8.6	Dl	804	13.0	Pt	799	9.3	Ch
783	9.2	Hf	745	5.8	Sl	797	10.0	Sf	V ORI			813[	13.6	Bs	799	9.8	Wa
786	8.8	Jo	753	6.0	Bl	800	9.5	Ch	050003			T PIC			800	10.4	Sx
796	9.3	Jo	756	5.8	Sl	803	9.5	B	660	12.3	Fc	*051247*			801	10.0	Hf
799	9.3	Ch	764	5.8	Bl	803	9.4	Jo	671	12.6	Fc	767	12.1	Ht	802	9.3	Mc
800	9.5	Sx	767	5.6	Ht	806	9.4	Jo	774	13.3	Ch	787	10.6	Ht	803	9.3	Jo
802	9.9	Af	768	5.7	Sl	813	9.6	Cm	785	12.5	B	NOV TAU			804	9.1	My
802	9.8	Dl	784	5.6	En	R LEP			794	11.4	Ra	051316			804	8.8	Pt
802	9.9	Fr	787	5.8	Ht	*045514*			800	11.2	Ch	782	14.4	Ar	805	9.3	Jo
803	9.5	Jo	R CAE			731	7.0	Hq	802	11.3	Hf	783	14.7	Ar	806	10.1	Ba
803	9.8	Ra	*043738*			746	6.8	Fn	803	11.4	B	784	14.5	Ar	806	10.2	Dl
804	10.0	Pt	753	9.9	Bl	773	7.2	Si	803	11.7	Jo	785	14.7	Ar	806	10.0	Hf
805	9.7	Dl	764	8.9	Bl	773	7.2	By	804	10.9	Pt	795	14.4	Ar	807	10.3	Dl
805	9.8	Hf	767	9.1	Ht	775	7.1	Si	806	11.4	Jo	801	14.9	Ar	808	9.3	Io
807	10.6	Dl	784	7.4	En	775	7.2	Sd	808	11.0	Jo	802	14.9	Ar	814	10.4	Ba
808	9.8	Jo	787	8.1	Ht	776	7.1	Si	813	10.7	Cm	T COL			815	9.4	Jo
814	9.8	Wh	R PIC			776	7.1	Sd	814	10.9	Sh	*051533*			814	10.3	Dl
814	10.6	Dl	*044349*			777	7.0	Sd	814	11.0	Ie	753	8.3	Bl	815	9.9	Wa
RX TAU			753	7.7	Bl	777	7.2	Si	815	10.8	Jo	764	8.7	Bl	815	9.8	Wp
043208			763	7.7	Bl	780	7.5	Ch	T LEP			767	9.0	Ht	W AUR		
656	13.6	Fc	764	7.9	Bl	783	7.8	Fr	*050022*			772	9.2	dK	052036		
671[	13.5	Fc	767	8.4	Ht	784	7.1	Si	753	11.4	Bl	778	9.4	dK	671[	13.2	Fc
769	12.0	Ch	784	8.2	En	786	7.0	Jo	764	11.3	Bl	784	10.2	dK	752	13.4	Ch
782	13.0	Ar	787	8.7	Ht	789	8.1	Gy	773	11.5	Fi	785	9.9	En	783	10.8	Fr
782	12.5	B	V TAU			793	7.1	Hb	780	11.5	Ch	787	10.7	Ht	783	9.9	Hf
783	12.7	Ar	044617			795	7.8	Af	783	11.0	Fr	790	10.3	dK	785	9.6	Fr
784	12.8	Ar	656	10.0	Fc	795	7.8	Fr	798	9.7	Bj	795	10.8	dK	785	9.6	Af
784	12.4	Hk	660	10.0	Fc	795	8.0	Ch	798	11.2	Sp	S AUR			786	10.0	Ch
785	12.7	Ar	671	10.5	Fc	796	7.4	Jo	799	10.0	Jo	052034			786	9.9	Ra
800	12.0	Ch	769	11.8	Ch	797	8.3	Hf	800	9.9	Jo	660	8.9	Fc	786	9.6	Wa
801	12.0	Ch	785	10.3	Jo	798	8.5	Sp	800	10.4	Ch	671	8.6	Fc	786	9.8	Wp
803	12.0	Jo	786	10.6	B	799	7.3	Jo	801	10.2	Mw	717	9.0	Fc	787	9.3	Jo
804	12.0	Pt	796	9.6	Jo	799	7.4	Hh	802	10.4	Mw	752	9.3	Ch	789	9.4	B
805	12.1	Jo	797	9.0	Ch	799	8.6	Kp	802	10.3	Hf	773	9.8	Pk	796	9.4	Hi
806	11.8	Rb	799	9.4	Jo	800	7.5	Bj	804	10.0	Pt	775	9.0	Pk	795	9.5	Lt
808	11.7	Jo	802	9.3	Gy	800	8.0	Sx	805	9.4	Jo	776	8.8	Pk	797	9.3	Sf
R RET			803	9.3	B	802	8.6	Kp	806	9.5	Wd	776	9.0	Sq	799	9.0	Ch
043263			803	9.4	Jo	802	8.6	Dl	806	9.6	Mw	776	9.8	Hk	800	9.2	Sx
745	7.6	Sl	804	9.0	Pt	802	8.5	Gy	807	10.3	Hf	776	9.9	Pb	800	9.2	Hi
753	7.3	Bl	805	9.3	Jo	802	8.4	Hk	808	8.8	Jo	776	9.5	Ch	801	9.3	Hf
763	8.0	Bl	808	9.3	Io	802	7.8	Hm	810	9.6	Mw	782	9.1	Pk	802	9.3	Ma
767	7.9	Ht	814	9.1	Ie	803	7.5	Jo	812	9.0	Mw	783	9.4	Fr	802	9.2	Hi
784	8.7	En	814	9.3	Bs	803	8.8	Ra	815	8.5	Io	783	10.0	Hf	803	9.0	Jo
787	8.7	Ht	AB AUR			804	8.0	Hm	815	9.0	Wd	784	9.9	Af	804	9.0	Pt
X CAM			044930			804	7.2	Pt	S PIC			784	9.8	Fr	805	8.9	Io
043274			787	7.0	Lt	805	8.6	Dl	*050848*			785	9.8	Fr	806	9.2	Hf
717	8.2	Fc	795	7.0	Lt	806	8.5	Hf	753	10.7	Bl	785	9.7	Af	807	9.4	Mo
774	13.5	Ch	802	6.9	Lt	806	7.5	Jo	764	10.9	Bl	786	9.8	Wa	808	9.0	Jo
776	12.4	Pk				806	8.5	Rc	785	11.4	En	786	9.6	Wp	813	9.9	Cm

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
W AUR			T ORI			T ORI			AN ORI			RR TAU			SU TAU		
052036			*053005a*			*053005a*			*053005t*			053326			054319		
814	9.1	Ie	782	10.1	Dh	805	9.7	Cm	802	11.5	Lf	808	11.4	Wp	802	10.0	Ch
S ORI			782	9.5	Ar	805	10.3	Hf	802	11.7	Hu	814	11.5	Cy	802	10.0	Hf
052404			782	9.5	Ar	805	11.0	Jo	802	11.4	Ma	814	11.3	Wp	802	10.0	Ar
750	9.3	Fn	783	10.0	Hf	806	10.0	Wa	806	11.5	Wa	814	11.4	Wa	802	10.0	Ie
756	9.4	Ch	783	9.5	Ar	806	10.1	Rb	806	11.6	Wd	814	11.5	Fi	803	10.0	Jo
773	8.3	Fn	783	9.6	Fr	806	10.6	B	807	11.5	Wa	815	12.4	Wa	804	10.3	Pt
776	9.0	Ch	784	9.9	Pb	806	10.2	Hf	807	11.5	Wp	815	12.4	Wp	805	10.0	Hf
777	9.5	Fn	784	10.0	Dh	806	10.0	Kg	814	11.5	Wa	RU AUR			805	10.5	Pt
785	8.8	Ch	784	9.6	Af	806	10.3	Wd	815	11.5	Wd	053337			805	10.0	Jo
786	8.9	B	784	9.7	Hk	807	10.2	Hf	S CAM			660	11.3	Fc	806	10.1	Mw
787	8.8	Jo	784	9.9	Ar	807	10.1	Wa	053068			671	11.4	Fc	806	10.1	Rb
789	9.1	Rb	784	9.5	Fr	807	10.2	Wp	717	10.2	Fc	752	13.4	Ch	806	9.9	Wd
789	9.2	Gy	785	10.3	B	807	9.9	Cy	776	10.1	Ch	804	12.0	Pt	806	10.0	Hf
792	8.8	Hf	785	10.4	Jo	808	11.0	Jo	777	10.0	Si	U AUR			807	9.9	Sf
792	8.8	Wd	785	9.9	Ar	808	10.0	Cy	783	10.1	Hf	053531			807	10.0	Wp
795	9.7	Af	785	9.6	Fr	814	9.9	Sh	786	9.7	Wa	660	8.3	Fc	807	9.9	Gy
797	8.9	Hf	785	9.8	Dh	814	9.8	Cy	786	9.9	Wp	671	8.3	Fc	807	10.0	Wa
797	8.8	Ch	785	9.8	Hk	814	10.2	Wa	799	9.5	Ch	717	9.7	Fc	807	10.5	Pt
798	9.4	Sp	787	10.2	Ra	814	10.5	Fi	802	10.4	Fr	752	11.2	Ch	807	10.1	Hf
800	9.4	Sx	789	9.8	Rb	814	10.3	Wp	802	10.3	Hk	798	12.6	B	808	10.1	Jo
801	10.0	Po	789	10.1	Bs	815	9.9	Wd	804	9.9	My	799	12.6	Ch	808	10.1	Wa
802	9.6	Dh	789	9.8	Cm	815	10.7	Jo	804	10.1	Pt	800	12.5	Ra	808	10.0	Wp
802	10.0	Dl	792	10.0	Hf	815	9.8	Cm	805	10.0	Hf	804	13.1	Pt	810	9.8	Mw
802	9.7	Af	792	10.0	Wd	AN ORI			RR TAU			SU TAU			811	10.6	Pt
803	9.1	B	792	10.0	Sh	*053005t*			053326			054319			813	10.5	Pt
802	8.8	Ch	795	9.8	Hf	746	12.2	Ma	757	11.2	Cy	752	9.5	Ma	814	9.9	Wa
803	9.6	Ra	795	10.4	Ar	773	11.5	Fi	773	10.8	Fi	753	10.0	Ch	814	10.0	Fi
803	8.7	Jo	795	9.8	Fr	776	11.9	Pb	775	11.3	Cy	756	10.1	Ch	814	10.0	Wp
804	9.8	Pt	795	10.4	Dh	776	11.9	Ar	779	11.2	Ry	773	10.2	Fi	814	10.1	Sh
805	9.2	Jo	796	10.7	Jo	776	11.9	Dh	782	11.9	Ar	773	9.7	Ch	815	10.0	Wa
805	9.1	Hf	797	9.9	Wa	776	11.6	Hk	783	12.0	Ar	782	10.3	Ch	815	9.9	Wp
806	9.5	Cm	797	10.3	Ch	782	11.9	Dh	784	11.8	Ar	782	10.0	Ar	815	10.0	Jo
806	9.6	Kg	797	9.9	Hf	782	11.3	Ar	785	11.6	Ar	783	10.2	Hf	S COL		
806	9.4	Rb	798	9.7	Fr	782	11.6	Ar	786	11.3	Wa	783	10.0	Ar	*054331*		
807	9.9	Dl	798	10.0	Wd	783	11.8	Ar	786	11.1	Wp	784	10.0	Ar	767	13.1	Ht
807	9.5	Gy	798	10.2	Ar	784	11.7	Pb	789	11.5	B	785	10.0	Ar	784	12.0	En
808	9.0	Jo	798	10.6	Pt	784	11.9	Ar	789	11.5	B	786	10.3	Wa	Z TAU		
808	9.8	Dl	799	10.0	Hf	784	12.0	Dh	789	11.6	Rb	786	10.3	Wp	054615a		
814	9.9	Dl	799	10.2	Wa	784	11.7	Hk	789	11.5	Gy	786	10.3	Ch	782	13.8	Ch
814	8.5	Wh	799	11.0	Jo	785	11.9	Ar	793	11.0	Wa	789	10.2	Gy	784	13.1	Hk
814	9.0	Sh	801	10.7	Po	785	11.8	Dh	793	11.0	Wp	789	10.3	Rb	802	13.0	Hk
815	9.7	Wd	801	10.1	Pb	785	11.7	Hk	795	11.4	Ar	793	10.3	Wa	807	13.7	Ie
815	9.9	Dl	801	9.9	Hf	787	11.3	Rc	795	11.4	Ar	793	10.3	Wp	RS TAU		
815	9.3	Jo	801	9.6	Ar	795	11.5	Dh	796	11.0	Ry	794	9.7	Pt	054615b		
T ORI			801	9.6	Fr	795	11.5	Ar	798	11.2	B	795	10.1	Ar	784	9.2	Hk
053005a			801	9.6	Dh	797	11.4	Wa	799	11.0	Wa	797	9.9	Hf	789	8.8	Gy
746	9.4	Ma	802	10.2	Hu	798	11.2	Ar	799	11.6	Rb	797	10.2	Ch	802	9.0	Gv
749	10.5	Cy	802	10.1	Pb	798	11.6	Wd	801	10.8	B	798	10.0	Wd	802	9.5	Hk
756	10.2	Ch	802	9.6	Ma	799	11.5	Wa	801	11.5	Ar	798	9.8	Pt	RU TAU		
757	10.0	Cy	802	9.6	Hf	801	11.7	Pb	802	11.3	Gy	798	10.4	Ar	054615c		
773	10.3	Fi	802	9.6	Af	801	11.5	Ar	802	11.7	Ar	799	10.4	Wa	782	12.6	Ch
775	10.1	Cv	802	9.5	Ar	801	11.5	Fr	803	11.0	Ry	799	9.9	Jo	784	12.4	Hk
776	10.6	Hk	802	9.9	Fr	801	11.5	Dh	807	11.7	Gy	799	10.3	Rb	789	11.2	Gy
776	10.5	Pb	802	10.2	Dh	802	11.6	Pb	807	11.0	Wa	799	10.0	Hf	800	12.6	Ch
776	10.7	Ar	802	10.1	Hk	802	11.4	Ar	807	11.1	Wp	801	10.0	Ar	802	12.6	Hk
776	10.5	Fr	802	10.1	Lf	802	11.6	Fr	807	11.4	Cy	801	10.2	Mw	802	12.6	Gy
776	10.6	Dh	803	11.5	Jo	802	11.4	Dh	807	11.4	B	801	10.0	Hf	807	12.5	Ie
776	10.9	Ch	804	10.3	My	802	11.7	Hk	808	11.3	Wa	802	10.0	Gy			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R COL			U ORI			Z AUR			R MON			R LYN			R GEM		
054620			054920a			055353			063308			065355			070122a		
767	13.0	Ht	802	6.3	Hm	807	10.3	Cy	784	11.9	Ar	770	8.0	Je	802	7.2	Hk
785	12.5	En	802	6.2	Hu	808	9.8	Jo	785	12.0	Ar	783	8.2	Hf	802	7.6	Fr
802	13.0	Ch	802	6.6	Mc	813	9.9	Pt	797	12.2	Bj	785	8.2	Hk	802	7.2	Ch
U ORI			802	6.5	Kp	814	9.5	Cy	799	10.8	Jo	785	8.0	Ch	805	7.5	Jo
054920a			802	5.8	Ch	R OCT			802	12.5	Ar	789	8.3	Jo	805	6.9	Pt
753	8.0	Ch	803	6.2	Ad	*055686*			802	12.8	Ch	799	8.6	Jo	806	7.1	Wd
757	7.4	Ch	803	6.2	Bu	753	10.2	Bl	803	11.0	Jo	799	8.9	Wa	814	7.2	Ad
770	5.9	Je	803	6.4	Jo	764	9.7	Bl	805	11.8	B	799	8.4	Hh	814	7.6	Sh
773	6.2	Si	804	6.4	Hm	767	10.1	Ht	808	10.6	Jo	800	8.5	Ra	Z GEM		
773	6.2	By	804	5.8	Pt	787	7.8	Ht	NOV PIC			802	8.8	Sx	070122b		
773	7.0	Fi	805	6.5	B	X AUR			*063462*			802	8.6	Bj	798	12.4	Wd
773	6.7	Kp	805	6.2	Bu	060450			766	9.0	En	802	9.2	Hf	800	11.0	Sx
775	6.3	Si	805	6.4	Dl	717	8.9	Fc	767	9.1	Ht	803	8.7	Jo	802	11.0	Hk
775	6.3	Sd	806	6.4	Dl	755	10.1	Ch	784	9.0	En	803	8.5	Ch	802	11.0	Fr
776	6.3	Sd	806	6.5	Hm	758	10.4	Ch	787	8.9	Ht	808	8.8	Jo	806	12.4	Wd
776	6.2	Si	806	6.1	Jo	767	11.2	Ch	S LYN			814	9.2	Ie	TW GEM		
777	6.2	Si	806	6.3	Kg	773	11.5	Ch	063558			RS GEM			070122c		
777	6.2	Sd	806	6.5	Mw	776	11.6	Ch	783	9.9	Ry	065530			708	8.4	Fr
780	6.8	Kp	806	7.1	Kd	776	11.6	Pb	785	10.1	Hk	776	12.1	Hk	783	8.5	Hf
781	7.0	Kp	806	6.7	Wd	776	11.6	Hk	785	10.2	Ch	789	11.2	Gy	787	8.4	Ra
781	6.3	Sq	807	6.4	Dl	782	11.9	Ch	789	10.1	Ry	799	10.4	Jo	787	8.2	Lt
782	6.6	Bu	807	6.6	Gy	797	12.8	Ch	797	10.6	Sf	802	11.1	Ar	795	8.2	Lt
782	6.0	Ch	807	6.5	Hm	798	12.8	B	800	10.8	Ra	802	11.0	Hk	798	8.4	Wd
783	6.8	Hf	807	5.9	Fd	800	12.8	Ch	802	10.8	Ch	803	10.7	Jo	800	8.5	Sx
784	6.1	Si	808	7.1	Kd	800	12.5	Ra	803	10.9	Ry	807	10.8	Gy	801	8.5	Hf
785	7.5	Fr	808	6.4	Dl	804	12.7	Pt	804	10.9	My	808	11.0	Jo	802	8.3	Hk
786	6.5	Ra	808	6.5	Hm	TV GEM			807	11.5	B	V CMI			806	8.2	Lt
787	6.3	Jo	810	6.6	Rc	060521			807	11.2	Sf	070109			806	8.3	Wd
789	6.7	Bs	813	6.6	Cm	788	6.4	Lt	X GEM			773	9.4	Si	814	8.4	Sh
789	6.6	Kp	814	6.2	Bs	795	6.4	Lt	064030			773	9.5	By	R CMI		
789	7.2	Cm	814	6.8	Sh	804	6.4	Lt	789	12.6	Gy	776	9.4	Si	070310		
789	6.4	Gy	814	6.2	Ad	V AUR			798	12.7	B	783	9.8	Ch	773	8.7	Si
790	6.4	Jo	814	6.6	Dl	061647			807	12.9	Gy	786	10.3	Jo	773	8.7	By
792	6.2	Kg	814	6.5	Hm	786	12.0	Ch	Y MON			789	10.3	Gy	776	8.9	Si
794	6.4	Ad	814	5.9	Hb	789	11.7	Gy	065111			799	10.8	Hf	783	9.3	Ch
795	6.0	Ch	815	6.7	Hm	798	11.4	B	785	10.6	Ch	802	11.3	Ch	786	8.4	Jo
795	6.8	Sx	815	6.6	Dl	799	11.7	Ch	799	11.6	Hf	803	11.4	Jo	789	9.4	Gy
797	6.6	Hf	UW ORI			802	11.3	Gy	802	11.7	Ch	807	11.2	Hf	799	8.7	Hf
798	6.1	Cm	054920b			V MON			804	12.5	Pt	807	11.3	Gy	799	8.7	Jo
798	6.6	Sp	773	11.0	Fi	*061702*			805	12.3	B	815	11.7	Wd	801	8.8	Mw
798	7.1	Kd	V CAM			782	10.8	Ch	X MON			R GEM			802	9.4	Fr
798	6.3	Kg	054974			799	11.6	Hf	*065208*			070122a			802	8.7	Mw
798	6.7	Wd	776	12.2	Ch	802	10.6	Ie	773	7.6	Si	753	9.3	Ch	802	8.6	Ch
798	7.1	Si	798	12.9	B	802	10.7	Ch	773	7.8	By	783	8.3	Hf	803	8.5	Jo
798	6.2	By	799	12.8	Ch	804	10.9	Pt	775	7.8	Si	785	7.6	Ch	805	8.7	Pt
799	6.9	Hh	804	12.6	Pt	UU AUR			776	7.8	Si	786	8.6	Jo	807	8.7	Gy
799	6.7	Kp	813	13.5	Bs	062938			776	7.9	Sd	787	7.6	Ra	807	9.2	Hf
799	6.5	Fs	Z AUR			795	5.7	Lt	789	7.8	Gy	796	8.4	Jo	808	8.5	Jo
799	6.5	Hm	055353			804	5.7	Lt	799	8.3	Hf	798	7.7	Wd	810	8.8	Mw
800	6.0	Hb	757	10.1	Cy	U LYN			799	7.7	Jo	798	7.6	Si	814	8.4	Sh
800	6.6	Rc	782	10.0	B	063159			800	7.5	Bj	798	7.7	By	815	8.6	Wd
800	6.7	Mc	789	10.2	Rb	785	12.1	Hk	803	7.7	Ad	799	7.1	Hh	815	8.6	Jo
801	6.2	Bu	796	9.9	Jo	801	12.5	B	803	7.7	Jo	799	8.2	Jo	L_2 PUP		
801	6.5	Fr	798	10.2	Pt	R MON			806	7.3	Hb	799	7.7	Wa	*071044*		
801	6.6	Je	799	9.9	Jo	063308			807	7.7	Gy	800	7.4	Sx	756	3.7	Sl
801	6.8	Mw	802	10.4	Mc	782	11.6	Ar	808	7.9	Jo	801	7.6	Jo	768	3.8	Sl
802	6.2	Bj	803	9.7	Jo	782	12.8	Ch	814	8.0	Jo	801	7.7	Je			
802	6.5	Dl	803	10.0	B	783	11.8	Ar	814	7.5	Ad	801	7.4	Hf			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
RR MON			S GEM			R CNC			T CNC			R LEO			S CAR		
071201			073723			081112			085120			094211			*100661*		
785	13.4	Ch	755	9.6	Ch	812	10.5	Mw	808	9.6	Jo	758	6.8	Ch	772	6.3	dK
801	13.2	Hi	776	9.3	Hk	V CNC			811	8.8	Pt	773	7.5	Si	778	6.3	dK
V GEM			776	9.4	Pb	081617			S PYX			773	7.6	Fn	784	6.5	dK
071713			783	9.3	Hf	773	9.3	Fn	*090024*			773	7.2	Kp	787	6.9	Ht
785	8.2	Ch	785	9.1	Ch	773	9.3	Si	810	12.4	Mw	775	7.3	Si	790	6.8	dK
799	8.9	Jo	799	9.6	Hf	777	9.0	Si	V UMA			779	8.2	Kp	795	7.0	dK
802	8.1	Hk	799	9.9	Jo	785	9.3	Ch	090151			788	8.5	Kd	U UMA		
803	8.7	Jo	802	9.5	Ch	790	9.8	Gy	773	10.3	Cl	792	8.3	Kd	100860		
804	8.4	Jo	803	9.8	Jo	799	10.2	Hf	796	10.6	Jo	797	8.7	Hf	787	6.4	Lt
805	8.0	Pt	805	9.7	Pt	801	10.0	Mw	800	10.3	Mc	799	8.4	Cm	795	6.5	Lt
808	8.4	Jo	806	9.9	Wd	803	10.8	Jo	801	10.5	Hk	799	8.5	Kd	802	6.4	Lt
811	8.3	Lt	808	10.0	Jo	803	10.7	Ch	803	10.5	Jo	800	8.2	Bj	811	6.5	Lt
815	8.3	Jo	812	9.9	Sp	805	10.6	Pt	808	10.5	Jo	801	8.7	Kp	Z CAR		
S CMI			813	9.9	Cm	807	10.7	Gy	815	10.6	Jo	801	8.7	Mw	*101058a*		
072708			815	10.0	Ie	810	11.0	Mw	W CNC			801	8.5	Kd	753	12.6	Bl
777	10.0	Fn	815	10.0	Jo	812	10.8	Mw	090425			802	8.7	Kp	W VEL		
783	11.3	Ch	815	9.9	Wd	RT HYA			785	10.8	Ch	802	7.9	Hm	*101153*		
797	10.4	Ch	W PUP			*082405*			RW CAR			802	8.9	Mw	753	11.0	Bl
799	10.4	Cm	*074241*			773	7.2	Si	*091868*			802	8.8	Wd	764	10.9	Bl
802	10.1	Sx	753	9.4	Bl	774	7.2	Fn	753	9.5	Bl	803	9.1	Fr	U HYA		
805	10.4	Pt	764	10.0	Bl	800	7.2	Bj	764	9.8	Bl	803	8.8	Ch	*103212*		
807	10.2	Hf	772	11.3	dK	804	7.4	My	787	10.6	Ht	805	8.8	Dl	788	6.1	Kd
807	10.1	Fd	778	11.9	dK	805	7.5	Pt	Y VEL			806	9.2	Mw	804	6.1	Kd
814	10.2	Sh	T GEM			808	7.8	Jo	*092551*			807	9.0	Dl	810	6.3	Kd
815	9.8	Wd	074323			814	7.7	Jo	753	12.9	Bl	807	9.2	Fd	R UMA		
815	10.1	Cm	755	9.4	Ch	R CHA			R CAR			807	8.0	Hm	103769		
T CMI			783	9.4	Hf	*082476*			*092062*			807	8.5	Kd	753	7.9	Ch
072811			785	9.0	Ch	753	12.6	Bl	753	6.4	Bl	808	9.0	Dl	773	8.1	Si
785	10.9	Ch	789	9.2	Gy	785	12.6	En	756	6.0	Sl	808	8.9	Jo	774	8.0	Ch
797	11.4	Bj	799	9.2	Hf	U CNC			764	5.5	Bl	810	9.3	Mw	776	7.7	Pb
805	11.0	Pt	799	9.7	Jo	083019			768	5.1	Sl	810	8.6	Kd	776	8.3	Si
815	11.1	Ie	802	9.5	Lf	746	14.1	Ma	772	5.5	dK	811	8.4	Pt	783	8.4	Hf
Z PUP			802	9.5	Hk	785	12.4	Ch	778	5.3	dK	812	9.3	Mw	784	8.3	Pb
072820b			802	9.4	Gy	799	11.4	Hf	784	4.8	dK	814	9.0	Dl	789	8.8	Gy
789	8.8	Gy	802	9.2	Ch	803	11.2	Jo	787	4.4	Ht	814	8.9	Jo	789	8.6	Dl
801	8.6	Mw	803	9.9	Jo	S HYA			790	4.6	dK	815	8.3	Hm	789	8.3	Jo
802	8.6	Gy	803	9.5	Sp	084803			795	4.5	dK	815	8.9	Dl	792	8.5	Hf
810	8.2	Mw	805	9.8	Pt	757	10.7	Ch	X HYA			815	8.9	Wd	792	8.5	Wd
S VOL			808	10.1	Jo	799	8.6	Hf	*093014*			Z VEL			792	8.5	Sh
073173			813	10.0	Cm	803	8.2	Ch	757	11.0	Ch	*094953*			794	9.4	Ch
753	10.5	Bl	815	10.1	Wd	805	8.3	Pt	789	11.0	Gy	753	12.8	Bl	794	8.7	Dl
764	10.6	Bl	815	10.2	Ie	808	8.0	Jo	800	11.5	Bj	787	12.1	Ht	796	8.5	Jo
U CMI			815	9.9	Jo	814	8.2	Jo	803	11.8	Ch	V LEO			798	8.9	Wd
073508			U PUP			T HYA			811	11.2	Pt	095421			799	8.5	Hm
757	10.6	Cy	*075612*			*085008*			813	10.1	Cm	746	13.3	Ma	799	9.2	Hh
785	9.4	Ch	801	12.7	Mw	757	8.4	Ch	815	10.9	Wd	811	12.6	Pt	799	9.6	Cm
799	9.8	Jo	R CNC			799	7.7	Hf	R LMI			RR CAR			801	9.3	Hk
802	9.2	Fr	081112			800	7.8	Bj	093934			*095458*			801	9.1	Jo
802	9.2	Hk	777	10.8	Si	803	7.2	Ch	785	11.7	Ch	787	7.8	Ht	802	9.1	Dl
803	9.4	Jo	785	10.8	Ch	808	8.2	Jo	790	12.1	Gy	RV CAR			802	9.0	Hk
805	9.5	Pt	799	10.7	Hf	810	7.9	Mw	807	12.7	Gy	*095563*			802	8.7	Hm
807	9.1	Cy	799	11.5	Jo	811	7.8	Pt	811	12.5	Pt	753	13.1	Bl	802	8.5	Pb
808	9.3	Jo	801	10.7	Mw	814	8.2	Jo	R LEO			S CAR			803	8.8	Hm
814	9.6	Cy	802	10.6	Mw	T CNC			094211			*100661*			804	8.9	Ra
815	9.3	Jo	803	11.7	Jo	085120			746	6.8	Ma	753	5.6	Bl	804	9.0	Hm
			803	10.8	Ch	785	9.6	Ch	747	6.9	Fn	756	5.5	Sl	805	9.6	Jo
			805	10.8	Pt	803	10.4	Ch	753	7.0	Fn	764	5.7	Bl	805	9.2	Dl
			810	10.7	Mw	805	9.4	Jo	753	6.6	Ch	768	6.0	Sl	806	9.2	Dl

Variable Star Observations Received During January, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R UMa			**R Com**			**S UMa**			**T Cen**			**V Boo**			**S CrB**		
103769			115919			123961			*133633*			142539a			151731		
806	9.2	Hm	789	11.6	Gy	753	9.4	Ch	788	6.7	Kd	799	8.1	Hf	753	8.7	Fn
806	9.3	Hf	**SU Vir**			773	10.5	Fn	790	6.6	Kd	802	8.0	Ch	773	9.1	Si
807	9.3	Dl	120012			773	10.4	Si	792	6.6	Kd	807	7.9	Cy	774	9.3	Fn
807	9.3	Hm	811	12.0	Pt	776	10.4	Dh	797	6.7	Kd	808	7.8	Jo	776	9.2	Ch
807	9.0	Gy	**T Vir**			776	10.4	Pb	801	7.0	Kd	813	8.0	Pt	789	9.7	Ch
807	9.5	Cy	120905			776	10.4	Ch	804	7.0	Kd	814	8.0	Jo	*797*	9.9	Kd
808	9.8	Jo	813	11.8	Pt	789	10.9	Gy	807	7.0	Kd	814	8.3	Dl	803	9.7	Fr
808	9.4	Dl	**R Crv**			796	11.5	Jo	810	7.1	Kd	**R Cam**			803	10.0	Ch
811	9.5	Pt	*121418*			799	11.3	Jo	**R CVn**			142584			804	10.0	Ra
814	9.8	Dl	797	11.5	Kd	801	11.3	Hk	134440			783	8.2	Ch	813	10.1	Pt
815	10.0	Dl	804	10.8	Kd	802	11.0	Bj	773	8.6	Si	785	8.2	Jo	**RS Lib**		
815	10.1	Ba	810	10.7	Kd	802	10.7	Wa	774	8.6	Fn	789	8.3	Jo	*151822*		
815	9.5	Hm	813	10.4	Pt	804	11.4	Ra	799	9.0	Hf	792	8.4	Hf	663	12.3	Fc
815	9.7	Wd	813	10.7	Bj	805	11.4	Jo	804	8.8	Ra	801	8.3	Jo	**R Nor**		
V Hya			**RY UMa**			807	11.6	Gy	805	8.8	Jo	801	8.4	Hi	*152849*		
104620			121561			807	11.4	Fd	813	9.8	Pt	802	8.3	Wd	745	8.6	Bl
757	7.0	Ch	788	7.5	Lt	813	11.2	Pt	814	9.1	Jo	803	8.2	Ch	752	8.5	Bl
785	7.2	Jo	802	7.7	Lt	815	11.4	Wa	**T Aps**			805	8.4	Jo	**S UMi**		
802	6.8	Bj	**SS Vir**			**RU Vir**			*134677*			806	8.7	Hf	153378		
808	7.3	Jo	122001			124204			745	10.1	Bl	808	8.4	Jo	801	9.8	Jo
811	6.7	Pt	808	8.7	Jo	813	11.4	Bj	752	9.4	Bl	**R Boo**			802	11.1	Dl
815	7.4	Jo	814	8.6	Jo	**U Vir**			763	8.7	Bl	143227			802	10.3	Hf
W Leo			**T CVn**			124606			768	8.7	Bl	663	12.2	Fc	807	11.0	Dl
104814			122532			788	8.6	Lt	787	9.7	Ht	758	7.0	Ch	807	11.3	Sf
746	10.5	Ma	758	10.0	Ch	799	8.7	Hf	**Z Boo**			773	7.0	Si	808	11.0	Dl
S Leo			785	10.3	Jo	804	8.3	Lt	140113			773	7.0	By	808	9.6	Jo
110506			789	10.4	Gy	813	8.5	Pt	789	12.6	Gy	773	7.0	Sd	813	11.1	Pt
752	12.3	Ma	808	10.4	Jo	**U Oct**			**R Cen**			773	7.0	Fn	814	9.6	Jo
811	10.0	Pt	813	10.8	Bj	*131283*			*140959*			776	7.2	Ch	814	10.9	Dl
RY Car			814	10.6	Jo	753	12.8	Bl	745	10.0	Bl	785	7.3	Jo	815	11.0	Cm
111561			**Y Vir**			767	13.3	Ht	752	10.1	Bl	808	8.0	Jo	815	10.4	Wd
753	12.7	Bl	*122803*			**R Hya**			779	9.2	dK	813	8.5	Pt	**RR CrB**		
RS Cen			813	12.4	Bj	*132422*			783	8.9	dK	813	8.4	Bj	153738		
111661			**T UMa**			758	8.5	Ch	789	8.7	dK	814	8.5	Jo	788	8.0	Lt
753	12.7	Bl	123160			776	9.4	Ch	795	8.3	dK	**V Lib**			804	8.0	Lt
AD Cen			753	10.5	Ch	788	9.6	Kd	**U UMi**			*143417*			**R CrB**		
114858			776	11.5	Ch	789	9.8	Ch	141567			663	11.5	Fc	154428		
787	9.4	Ht	784	12.0	Pb	792	9.7	Kd	773	9.0	Pk	**U Boo**			643	6.2	Fc
W Cen			789	11.9	Ch	797	9.4	Kd	789	8.0	Jo	144918			647	6.3	Fc
115058			802	12.4	Bj	801	9.7	Kd	797	7.7	Hf	663	12.1	Fc	652	6.1	Kd
764	11.7	Bl	813	12.6	Pt	804	9.4	Kd	799	7.8	Jo	807	12.1	Cy	655	6.4	Kd
Z UMa			**R Vir**			807	9.7	Kd	804	7.8	Ra	**S Aps**			661	6.4	Kd
115158			123307			813	9.7	Pt	806	7.7	Jo	*145971*			677	6.4	Kd
773	7.7	Kp	753	8.8	Ch	**S Vir**			813	7.8	Pt	745	13.2	Bl	679	6.4	Kd
774	7.8	Kp	776	10.0	Ch	*132706*			**S Boo**			752	13.2	Bl	681	6.0	Mg
779	8.2	Kp	813	10.1	Pt	753	8.9	Ch	141954			763	12.5	Bl	696	6.2	Kd
780	8.1	Kp	**RS UMa**			757	9.1	Ch	776	12.5	Ch	768	12.5	Bl	701	6.2	Kd
781	8.1	Kp	123459			774	9.9	Ch	803	12.2	Ch	**RT Lib**			703	6.2	Kd
789	7.9	Kp	753	10.9	Ch	787	9.9	Ch	804	11.9	Ra	*150018*			720	6.3	Kd
789	7.7	Rb	784	13.2	Ry	803	10.7	Ch	813	11.0	Pt	663	8.2	Fc	741	6.3	Hr
797	8.2	Hf	799	12.5	Cm	813	11.5	Bj	**RS Vir**			**Y Lib**			743	7.2	Cm
799	8.3	Kp	802	12.1	Bj	813	12.0	Pt	142205			*150605*			743	7.0	Kg
799	8.1	Rb	802	12.4	Wd	**RV Cen**			813	11.9	Bj	663	12.2	Fc	745	7.0	Hr
802	8.3	Rb	807	11.6	Fd	*133155*			**V Boo**			**S Ser**			746	7.0	Hr
802	8.2	Kp	808	11.6	Jo	745	8.7	Bl	142539a			151714			747	7.2	Mg
805	8.2	Hf	813	10.8	Pt	**T UMi**			758	8.6	Ch	807	11.6	Cy	748	7.4	Mg
815	8.3	Wd	814	11.0	Jo	133273			785	7.8	Jo				749	7.6	Mg
			815	10.8	Wd	804	12.0	Ra	787	8.7	Dl				753	8.0	Fn

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
R CrB			V CrB			W Her			RV Her			RT Oph			RV Sgr		
154428			154639			163137			165631			175111			*182133*		
753	7.7	Mg	813	9.1	Cm	753	11.7	Ch	650	12.0	Fc	658[	13.9	Fc	768	7.9	Bl
767	7.8	Mg	Z CrB			R UMi			657	11.2	Fc	T Dra			SV Her		
772	9.1	Ch	155229			161372			666	10.4	Fc	175458a			182224		
773	9.4	Fn	663[	13.2	Fc	773	9.5	Fn	753[	13.3	Ch	752	12.6	Ch	650[	13.4	Fc
773	9.4	Si	T CrB			773	9.6	Si	774[	13.5	Pf	UY Dra			666[	13.4	Fc
776	9.5	Si	155526			776	9.7	Si	RT Her			175458b			T Ser		
782	9.5	Ch	813	9.8	Pt	783	9.8	Hf	170627			752	10.8	Ch	182306		
783	9.6	Si	RZ Sco			789	9.6	Jo	643[	13.4	Fc	RY Her			716[	12.2	Fc
783	10.0	Fn	*155823*			798	9.8	Wd	666[	14.3	Fc	175519			753	13.0	Ch
784	10.0	Si	663	7.9	Fc	799	9.6	Jo	753	10.3	Ch	645	11.8	Fc	RZ Her		
784	10.4	Fn	Z Sco			802	9.5	Hf	773	9.6	Pf	650	11.7	Fc	183225		
785	10.4	Si	*160021*			805	9.5	Jo	RW Sco			666	11.1	Fc	647[	13.3	Fc
785	9.8	Jo	663	9.2	Fc	814	9.6	Jo	*170833*			R Pav			658[	13.4	Fc
787	9.9	Dl	R Her			R Dra			745	13.0	Bl	*180363*			X Oph		
788	9.0	Sx	160118			163266			752	12.5	Bl	766	8.2	En	183308		
788	10.2	Kd	643	8.8	Fc	753	9.2	Ch	Z Oph			767	8.1	Ht	724	8.0	Fc
789	9.9	Gy	648	8.8	Fc	773	8.0	Kp	171401			772	7.9	dK	753	7.9	Fn
789	9.6	Ch	658	9.4	Fc	773	7.8	Pk	724	9.6	Fc	778	7.9	dK	753	8.3	Ch
790	10.0	Kd	U Ser			773	8.2	Si	RS Her			784	8.1	dK	774	8.5	Kp
792	10.0	Kd	160210			774	8.0	Kp	171723			787	8.5	Ht	775	8.1	Si
797	9.4	Kd	647[	12.0	Fc	776	8.1	Si	658	11.1	Fc	790	8.3	dK	776	8.0	Si
799	9.2	Kd	650	11.9	Fc	779	7.9	Kp	724	12.1	Fc	796	8.7	dK	789	7.5	Jo
799	9.3	Si	807	9.2	Cy	781	7.9	Kp	753	11.0	Ch	T Her			RS Dra		
801	9.5	Kd	813	8.5	Pt	783	7.8	Hf	S Oct			180531			184074		
802	9.6	Gy	814	8.9	Dl	787	7.8	Ra	*172486*			650	8.8	Fc	772	11.3	Ch
802	9.6	Ch	X Sco			789	7.5	Jo	745	10.5	Bl	657	8.7	Fc	RY Lyr		
803	10.0	Fr	*160221a*			792	7.6	Hf	752	9.8	Bl	666	8.1	Fc	184134		
803	9.4	Si	663	12.6	Fc	798	7.8	Wd	763	9.5	Bl	716	11.4	Fc	647[	13.3	Fc
804	9.5	Ra	SX Her			799	7.9	Kp	767	9.3	Ht	724	11.8	Fc	666[	14.1	Fc
804	9.2	Kd	160325			799	7.5	Jo	768	9.4	Bl	766	12.8	Ch	713	11.9	Fc
807	9.1	Cy	773	8.6	Si	802	8.1	Dl	772	9.3	dK	787	11.2	Jo	767	11.4	Ch
807	9.1	Kd	774	8.6	Fn	803	7.8	Ch	778	9.1	dK				774	11.8	Pf
810	8.9	Kd	788	8.4	Lt	805	8.0	Dl	784	9.1	dK	W Dra			783	12.0	Ar
813	8.7	Cm	789	8.3	Gy	805	7.7	Jo	787	9.1	Ht	180565			R Sct		
813	9.0	Pt	804	8.8	Lt	806	8.4	Hm	790	8.7	dK	802	13.1	Pf	*184205*		
814	9.5	Dl	813	8.1	Pt	807	8.1	Hm	796	8.8	dK	X Dra			652	5.3	Kd
814	9.0	Ie	RU Her			807	8.1	Dl	RU Oph			180666			655	5.4	Kd
815	8.9	Cm	160625			814	8.1	Dl	172809			802[	13.4	Pf	661	5.4	Kd
815	9.2	Sx	813[	12.4	Pt	814	8.2	Hm	658	10.9	Fc	W Lyr			681	5.7	Mg
817	9.6	Cy	W CrB			815	8.1	Hm	RU Sco			181136			691	5.4	Kd
X CrB			161138			815	8.1	Dl	*173543*			767	8.1	Ch	696	5.4	Kd
154536			643	12.4	Fc	S Her			745	8.8	Bl	773	7.9	Pk	701	5.7	Kd
813	10.5	Pt	646	11.9	Fc	164715			753	8.7	Bl	774	8.2	Kp	703	5.8	Kd
R Ser			647	12.0	Fc	788	7.8	Lt	763	8.1	Bl	776	8.0	Pk	720	5.7	Kd
154615			U Her			RS Sco			768	8.7	Bl	781	8.8	Kp	752	5.6	Ch
773	6.7	Si	162119			*164844*			SV Sco			783	8.9	Hf	753	5.3	Fn
774	6.7	Fn	643	10.5	Fc	745	6.8	Bl	*174135*			786	8.6	Pk	766	5.7	Ch
794	7.4	Ch	646	10.5	Fc	752	6.3	Bl	745	9.9	Bl	787	9.3	Ra	774	5.8	Hv
807	7.7	Cy	650	10.7	Fc	763	6.4	Bl	753	9.7	Bl	789	9.0	Kp	774	5.8	Bc
813	8.0	Pt	658	10.8	Fc	768	6.6	Bl	763	9.0	Bl	790	9.6	Jo	774	5.8	Kp
V CrB			813[	11.7	Cm	RR Sco			768	9.0	Bl	796	9.9	Jo	775	5.6	Si
154639			g Her			*165030a*			W Pav			799	10.2	Jo	776	5.6	Hv
643	7.7	Fc	162542			745	11.0	Bl	*174162*			802	10.5	Jo	776	5.5	Si
647	7.5	Fc	788	4.8	Lt	752	10.8	Bl	767[	13.0	Ht	RV Sgr			778	5.7	Hv
658	7.2	Fc	804	5.1	Lt	RV Her			RS Oph			*182133*			782	5.7	Hv
663	7.8	Fc	W Her			165631			*174406*			745	7.7	Bl	783	5.7	Hv
807	9.4	Cy	163137			643	12.5	Fc	656	11.6	Kd	753	7.8	Bl	783	5.5	Fr
813	8.0	Pt	643	8.8	Fc	646	12.3	Fc				763	7.9	Bl	783	5.4	Dh

Variable Star Observations Received During January, 1935.

J.D. Est. Obs. J.D. Est. Obs. J.D. Est. Obs. J.D. Est. Obs. J.D. Est. Obs. J.D. Est. Obs.

R Sct
184205
784 5.8 Ch
784 5.7 Hv
785 5.8 Hv
785 5.5 Fr
785 5.5 Dh

RW Lyr
185737
184243
650[13.0 Fc
767[13.4 Ch
713 12.3 Fc
783 14.5 Ar
767 11.2 Ch
785 14.2 Ar
783 12.3 Ar
802[12.6 Gy
802 13.3 Pf

Nov Aql
184300
190108
635 10.5 Fc
635 9.4 Fc
651 10.5 Fc
651 9.6 Fc
668 10.6 Fc
663 9.9 Fc
681 11.0 Mg
668 10.9 Fc
724 10.7 Fc
724 10.8 Fc
753 10.8 Ch
752 11.0 Ch
769 10.5 Ch
766 10.7 Ch

RX Lyr
185032
774 10.4 Ch
777 9.2 Hh
643[12.5 Fc
790 9.9 Jo
713 11.8 Fc

V Lyr
190529a
753 12.6 Ch
647 10.0 Fc
767 13.2 Ch
650 9.9 Fc
773 13.7 Pf
651 9.3 Fc
783 14.3 Ar
652 9.3 Fc
785 14.4 Ar
656 8.8 Fc

S CrA
185437a
659 9.2 Fc
745 12.1 Bl
662 8.7 Fc
745 11.9 Sl
767 12.4 Ch
753 12.8 Bl

RX Sgr
190818
767 12.1 Ht
752 10.5 Ch
769 12.2 Bl
767 9.9 Ht

ST Sgr
185512a
RW Sgr
190819a
716[12.6 Pd
752 10.3 Ch
752[12.3 Ch
767 10.0 Ht

R CrA
185537a
S Lyr
190925
745 11.9 Bl
767[12.3 Ch
745 11.1 Sl
RS Lyr
753 11.5 Bl
190933a
766 12.5 En
767[13.1 Ch
767 11.7 Ht
RU Lyr
769 12.5 Bl
190941

T CrA
185537b
767 12.0 Ch
745 13.0 Bl
U Dra
767[12.5 Ht
190967

Z Lyr
185634
752 13.4 Ch
643 12.3 Fc
772 11.7 Ch
647 12.0 Fc
787 11.6 Ra
650 12.0 Fc
797 11.2 Ch
713 11.6 Fc
799 11.5 Jo
802 11.6 Pf

Z Lyr
185634
767[13.4 Ch
SU Sgr
185722
767 8.4 Ht
RT Lyr
185737
650[13.0 Fc
713 12.3 Fc
767 11.2 Ch
783 12.3 Ar
802 13.3 Pf

R Aql
190108
635 9.4 Fc
651 9.6 Fc
663 9.9 Fc
668 10.9 Fc
724 10.8 Fc
752 11.0 Ch
766 10.7 Ch
774 10.4 Ch
777 9.2 Hh
790 9.9 Jo

V Lyr
190529a
647 10.0 Fc
650 9.9 Fc
651 9.3 Fc
652 9.3 Fc
656 8.8 Fc
659 9.2 Fc
662 8.7 Fc
767 12.4 Ch

RX Sgr
190818
752 10.5 Ch
767 9.9 Ht

RW Sgr
190819a
752 10.3 Ch
767 10.0 Ht

S Lyr
190925
767[12.3 Ch

RS Lyr
190933a
767[13.1 Ch

RU Lyr
190941
767 12.0 Ch

U Dra
190967
752 13.4 Ch
772 11.7 Ch
787 11.6 Ra
797 11.2 Ch
799 11.5 Jo
802 11.6 Pf

U Dra
190967
805 11.3 Jo

W Aql
191007
752 9.1 Ch

T Sgr
191017
752 12.4 Ch

R Sgr
191019
752 8.2 Ch
767 8.1 Ht
776 8.0 Si
777 8.1 Si

RY Sgr
191033
745 7.5 Sl
746 7.8 Bl
753 7.8 Bl
763 7.9 Bl
766 7.4 En
767 7.8 Ht
768 7.9 Bl
772 7.9 dK

TY Sgr
191124
753[12.4 Bl

S Sgr
191319a
752 12.2 Ch
767 11.3 Ht
769 11.5 Bl

SW Sgr
191331
769[12.9 Bl

TZ Cyg
191350
753 11.3 Ch
767 10.9 Ch
782 10.6 Ar
783 10.5 Ar
784 10.7 Ar
784 10.7 Pb
785 10.6 Ar
787 10.3 Ra
789 10.1 Jo
795 10.6 Ar
799 10.3 Jo
801 10.7 Ar
802 10.8 Ar
803 10.5 Jo
808 10.6 Jo

U Lyr
191637
787 11.8 Ra

UX Dra
192576
792 6.7 Lt

AF Cyg
192745
796 8.1 Kd
798 8.1 Kd
809 8.0 Kd

TY Cyg
192928
753 13.8 Ch
767 12.7 Ch
774 11.2 Pf
779 11.4 Lg
798 11.1 Ch
802 11.0 Ch

RT Aql
193311
769 13.2 Ch

R Cyg
193449
767 13.7 Ch
773 12.5 Pk
775 12.4 Pb
780 12.5 Ch
781 12.4 Pk
787 12.2 Ra
793 11.5 Es
794 12.0 Pt
797 11.8 Ch
798 11.4 Wd
805 12.4 Jo
806 11.5 Wd
806 11.5 Bs
807 11.4 Gy
808 12.0 Jo
815 11.7 Jo
816 11.4 Cm

RV Aql
193509
794 11.3 Pt
769 9.7 Ch

TT Cyg
193732
795 8.0 Lt

T Pav
193972
753 9.1 Bl
763 10.2 Bl
766 10.0 En
767 10.8 Ht
769 10.7 Bl
772 10.8 dK
778 11.4 dK
784 11.6 dK
787 11.9 Ht
790 11.7 dK

RT Cyg
194048
753 11.9 Ch
772 12.4 Ch
784 10.0 Si
786 12.0 B

RT Cyg
194048
787 12.0 Ra
790 11.7 Jo
794 10.9 Pt
796 11.8 Jo
797 10.9 Ch
798 10.8 Wd
799 11.5 Jo
803 10.7 Jo
805 10.3 Jo
806 10.1 Hf
806 10.0 Wd
807 9.5 Gy
808 9.6 Jo

TU Cyg
194348
772 13.8 Ch
780 13.2 Ch
786 12.2 B
797 11.8 Ch
806 11.3 Wd
807 11.2 Gy
808 11.4 Jo

X Aql
194604
769[12.9 Ch
794[12.3 Pt

χ Cyg
194632
751 9.5 Ch
753 9.6 Fn
764 8.7 Ch
770 8.7 Ch
770 9.2 Je
773 9.0 Kp
774 9.0 Kp
774 8.7 Ch
775 8.7 Cy
776 9.1 Si
777 9.0 Si
777 8.9 Fn
780 8.9 Kp
781 8.9 Kp
781 8.9 Hf
783 8.9 Fn
783 9.0 Hf
783 9.0 Ch
784 8.7 Si
786 9.1 Wa
786 9.0 Wp
787 8.6 Ch
787 8.5 Sx
787 8.5 Ra
789 8.5 Kp
789 8.3 Jo
789 8.7 Rb
790 8.2 Jo
790 8.5 Ch
792 8.6 Hf

χ Cyg
194632
793 8.1 Wa
793 8.2 Wp
793 8.2 Si
794 8.2 Fn
794 7.8 Pt
796 8.6 Hf
796 7.8 Jo
796 8.8 Kd
798 7.8 Ch
798 8.8 Kd
799 7.5 Kp
799 7.8 Jo
799 7.0 Rb
799 7.2 Wa
801 7.5 Jo
801 7.5 Ch
802 6.8 Bj
802 7.4 Gy
802 7.2 Wd
803 7.3 Ch
805 6.8 Hf
805 7.2 Rc
805 7.0 Jo
806 6.6 Hf
806 6.8 Rb
806 6.7 Wd
807 6.6 Gy
807 6.6 Hf
808 6.8 Jo
808 6.1 Kd
809 6.1 Kd
815 6.0 Jo
816 6.2 Cm

S Pav
194659
766 7.5 En

RR Sgr
194929
753 7.5 Bl
763 7.7 Bl
766 8.0 En
769 7.6 Bl
771 7.5 Ch

RU Sgr
195142
753 7.9 Bl
763 7.9 Bl
766 8.5 En
767 8.2 Ht
769 8.1 Bl
772 8.4 dK
778 8.8 dK
784 9.2 dK
790 9.5 dK

RR Aql
195202
769[13.1 Ch

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.	J.D. Est. Obs.
RS AQL	W CAP	RS CYG	WX CYG	U CYG	Z DEL
195308	*200822*	200938	201437b	201647	202817
770 11.3 Ch	769[12.8 Bl	793 8.7 Si	766 9.4 Ch	775 7.9 Cy	768 11.2 Ch
798 9.6 Bj	Z AQL	794 8.8 Fn	769 10.4 Cy	776 7.5 Si	776 11.5 Hi
NOV CYG	200906	795 8.6 Fr	772 9.3 Ch	776 7.4 Pk	783 11.2 Fr
195553	770 13.0 Ch	796 8.5 Jo	775 9.4 Pk	777 8.4 Hh	798 13.0 Ch
768[13.2 Ch	794 10.2 Pt	798 8.7 Cm	776 10.3 Ar	780 7.2 Ch	ST CYG
782 14.2 Ar	797 10.0 Bj	798 8.8 Fr	776 10.2 Pk	780 7.8 Kp	202954
783 14.2 Ar	802 9.7 Hi	798 8.8 Dh	776 9.3 Ch	780 7.6 Fs	753 10.5 Ch
785 14.4 Ar	R SGE	798 8.7 Kg	777 10.4 Si	781 7.7 Kp	785 9.8 B
795 14.3 Ar	200916	798 8.2 Pt	780 9.1 Ch	783 8.0 Hv	798 10.5 Pt
801 14.6 Ar	771 9.2 Ch	798 8.3 Wd	782 10.7 Ar	783 8.2 Hf	807 10.3 B
802 14.6 Ar	783 9.3 Ch	799 8.5 Jo	783 10.6 Ar	783 7.8 Ch	V VUL
RR TEL	789 9.4 Jo	800 8.8 Ch	783 9.5 Fn	784 7.7 Si	203226
195656	799 9.4 Jo	800 9.0 Rc	783 9.5 Hf	785 8.1 Hv	798 8.6 Pt
767[12.9 Ht	805 9.2 Jo	801 8.8 Fr	783 9.4 Ch	786 7.0 B	R MIC
Z CYG	815 9.2 Jo	801 8.8 Dh	784 10.6 Ar	787 7.7 Es	*203429*
195849	RS CYG	802 8.8 Ar	784 10.6 Pb	787 7.6 Ra	753 10.9 Bl
753 11.8 Ch	200938	802 8.8 Af	785 10.5 Ar	787 8.0 Sx	763 10.3 Bl
772 12.4 Ch	731 7.9 Hq	802 8.3 Bj	785 9.3 B	789 7.4 Sa	769 9.7 Bl
794 13.0 Pt	748 7.4 Ch	802 8.2 Bc	787 10.0 Ra	789 8.5 Dl	771 9.6 Ch
S TEL	749 8.2 Cy	802 8.1 Hv	787 9.5 Ch	789 7.6 Jo	Y DEL
195855	753 7.7 Fn	802 8.8 Dh	788 10.8 Bs	789 7.7 Rb	203611
767 12.9 Ht	753 7.4 Ch	802 8.8 Fr	789 9.7 Jo	789 7.8 Kp	768 12.8 Ch
769 13.1 Bl	757 8.2 Cy	803 9.0 Ch	789 10.7 Rb	792 8.2 Hf	798 13.6 Ch
SY AQL	764 7.2 Ch	805 8.7 Jo	793 9.9 Es	793 7.6 Si	S DEL
200212	769 8.7 Cy	806 8.9 Hf	795 9.6 Ch	796 7.7 Jo	203816
770 11.0 Ch	770 7.3 Je	806 8.9 Wd	796 9.8 Jo	797 7.5 Bj	768 11.0 Ch
794 12.1 Pt	772 7.4 Ch	808 8.7 Jo	798 9.7 Wd	797 8.0 Sf	785 10.0 B
S CYG	773 8.2 Fn	815 9.0 Jo	799 10.9 Rb	798 8.0 Cm	798 9.7 Pt
200357	773 8.6 Si	816 8.8 Cm	799 10.0 Jo	798 7.6 Kg	798 10.0 Ch
753 13.8 Ch	773 8.9 By	R DEL	800 9.2 Ch	798 7.8 Wd	801 12.0 Jo
794[12.4 Pt	775 8.6 Si	201008	802 10.8 Ar	798 7.5 Pt	806 12.0 Jo
R CAP	775 8.3 Cy	783 8.5 Hf	802 9.2 Bj	799 8.8 Hh	V CYG
200514	776 8.3 Ar	787 8.6 Ra	803 9.5 Ch	799 8.0 Rb	203847
752 12.5 Ch	776 8.4 Fr	789 8.5 Jo	805 10.3 Jo	799 7.8 Kp	753 13.0 Ch
S AQL	776 8.5 Si	795 8.4 Lt	806 9.8 Wd	799 7.7 Jo	770 13.3 Ch
200715a	776 8.6 Si	796 8.4 Jo	806 9.8 Hf	800 8.5 Mc	780 13.2 Ch
752 9.4 Ch	777 8.7 Fn	797 8.4 Bj	808 10.2 Jo	801 7.7 Je	797 13.4 B
764 9.7 Ch	780 7.6 Ch	798 8.3 Pt	815 10.4 Jo	802 7.7 Bc	Y AQR
770 10.0 Ch	782 8.4 Ar	799 8.5 Jo	V SGE	802 7.8 Hv	*203905*
783 10.5 Ch	783 8.3 Ar	808 8.8 Jo	201520	802 7.6 Kp	770 12.6 Ch
789 10.5 Jo	783 8.3 Af	810 8.5 Bj	770 12.8 Ch	802 8.6 Dl	780 12.2 Ch
794 10.2 Pt	783 8.8 Fn	SX CYG	783 12.0 Ar	802 8.5 Mc	798 9.6 Bj
799 10.7 Jo	783 8.5 Fr	201130	785 12.0 Ar	802 7.3 Sa	798 9.8 Pt
805 11.4 Jo	783 8.7 Hf	753[13.1 Ch	802 12.7 Gy	804 7.8 Wh	800 10.2 Ch
815 11.8 Jo	784 8.5 Ar	798[13.1 Pt	U CYG	805 7.8 Jo	811 9.2 Bj
RW AQL	784 8.4 Af	RT SGR	201647	806 7.9 Wd	T DEL
200715b	784 8.3 Fr	*201139*	731 7.7 Hq	806 8.5 Dl	204016
789 9.5 Jo	784 8.5 Pb	753 7.6 Bl	751 7.6 Ch	807 8.6 Dl	768 11.2 Ch
794 9.3 Pt	784 8.8 Si	763 8.0 Bl	753 7.6 Ch	807 7.6 B	784 11.5 Fr
799 9.6 Jo	785 8.4 Ar	766 8.0 En	764 7.6 Ch	814 8.6 Dl	785 11.5 Fr
805 9.4 Jo	785 8.4 Af	769 8.4 Bl	770 7.6 Je	815 8.5 Dl	798 12.8 Pt
815 9.2 Jo	785 8.4 Fr	WX CYG	770 7.6 Ch	U MIC	798 12.6 Ch
R TEL	787 8.4 Ch	201437b	772 7.2 Ch	202240	U DEL
200747	787 8.8 Ra	751 9.8 Ch	773 7.5 Si	769 11.7 Bl	204017
769 13.5 Bl	787 8.9 Sx	753 9.6 Ch	773 7.5 By	RU CAP	792 7.1 Lt
RU AQL	789 8.4 Jo	756 9.6 Ch	773 7.3 Pk	*202622*	795 7.0 Lt
200812	790 8.6 Ch	757 8.9 Cy	773 7.7 Kp	766 9.6 En	
770[13.0 Ch	792 8.6 Hf	764 9.4 Ch	774 7.8 Kp		

Variable Star Observations Received During January, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
V Aqr			UX Cyg			T Cep			X Peg			RU Cyg			TW Peg		
204102			205030a			210868			211614			213753			215927		
770	8.8	Ch	807[12.0		Gy	776	8.8	Sd	782	9.5	B	775	9.2	Cy	795	8.0	Lt
787	9.0	Es	RR Cap			779	9.0	Kp	798	10.3	Pt	777	9.0	Si	802	8.3	Lt
W Aqr			*205627*			780	9.0	Kp	T Cap			779	9.0	Ry	805	8.3	Lt
204104			766	10.4	En	780	8.8	Fs	*211615*			783	8.8	Cl	RT Peg		
776	13.3	Hi	771	10.6	Ch	781	8.4	Sq	752	11.7	Ch	786	8.9	Jo	215934		
U Cap			R Vul			781	8.6	Kp	753	11.6	Bl	789	8.9	Jo	754	11.0	Ch
204215			205923a			782	8.3	Pk	763	11.9	Bl	795	8.8	Cl	RZ Peg		
752	12.2	Ch	770	12.6	Ch	783	8.8	Ch	769	12.5	Bl	796	8.8	Jo	*220133b*		
769	11.3	Bl	772	12.6	Ch	783	8.7	Hf	S Mic			798	8.8	Pt	785	9.4	B
V Del			787	12.1	Es	784	8.6	Si	*212030*			799	8.8	Jo	806	9.6	B
204318			789	11.4	B	786	8.3	Pk	753	8.9	Bl	801	9.0	Je	Y Peg		
799	9.9	Ch	796	11.8	Jo	787	8.8	Ra	763	9.5	Bl	802	8.6	Hv	220613		
802	10.4	Gy	797	11.4	Bj	787	8.5	Sx	767	9.7	En	802	8.1	Bc	785[12.2		B
T Aqr			798	10.8	Pt	788	8.7	Bs	769	10.0	Bl	803	9.2	Ry	807[12.6		Gy
204405			799	10.5	Ch	788	8.5	Ch	771	10.4	Ch	803	9.0	Jo	RS Peg		
770	10.5	Ch	799	11.5	Jo	789	8.5	Kp	772	10.3	dK	806	9.0	Jo	*220714*		
780	9.8	Ch	803	11.2	Jo	789	8.1	Jo	778	10.7	dK	807	8.7	Cy	785	11.3	B
789	9.4	Cm	805	10.6	Hf	789	7.6	Rb	784	11.1	dK	808	8.8	Jo	806	9.0	B
790	9.5	Jo	806	10.6	Jo	791	8.3	Pk	796[11.3		dK	RV Cyg			807	9.5	Gy
796	9.0	Jo	806	10.2	Bs	793	7.9	Si	Y Cap			213937			808	9.2	Jo
798	8.2	Pt	811	9.7	Bj	794	8.2	Hb	*212814*			769	8.4	Ka	R PsA		
798	8.3	Bj	V Cap			795	8.4	Ch	752[13.2		Ch	779	8.5	Ka	*221230*		
799	8.6	Jo	*210124*			796	8.2	Jo	769[12.5		Bl	780	8.4	Ka	767[12.9		En
800	8.6	Ch	753	12.1	Bl	798	8.5	Pt	W Cyg			781	8.3	Ka	X Aqr		
802	8.8	Fr	769[12.5		Bl	798	7.9	Pk	213244			798	6.6	Pt	*221321*		
802	8.7	Dl	TW Cyg			798	8.1	Si	798	6.3	Kd	RR Peg			771	11.9	Ch
802	8.2	Hm	210129			798	8.2	By	802	5.9	Mc	214024			798	13.2	Bj
802	8.2	Af	753[13.2		Ch	799	8.0	Rb	808	5.5	Kd	754[13.1		Ch	802	13.8	Ch
805	8.4	Jo	799[13.7		Ch	799	7.9	Jo	809	5.5	Kd	797	13.2	Ch	T Gru		
808	8.0	Jo	806	13.1	Ie	799	8.1	Kp	S Cep			β Cep			*221938*		
811	7.5	Bj	X Cap			799	8.3	Fs	213678			214058			767	9.6	En
815	7.9	Hm	*210221*			801	8.0	Fs	751	9.5	Ch	792	4.0	Lt	S Gru		
RZ Cyg			769[12.4		Bl	801	8.0	Hk	770	9.7	Je	802	4.0	Lt	*221948*		
204846			X Cep			801	8.1	Je	781	9.6	Sq	R Gru			766	7.8	En
754[13.2		Ch	210382			802	8.1	Kp	783	10.3	Hf	214247			767	8.0	En
797	11.5	B	772	11.8	Ch	802	8.4	Hm	787	8.5	Dt	753	9.8	Bl	767	8.4	Ht
798	11.4	Pt	803	12.1	Ch	802	8.2	Wd	787	10.0	Ra	763	10.6	Bl	772	8.1	dK
801	11.6	B	Z Cap			803	7.8	Jo	789	8.5	Dt	767	10.7	Ht	778	8.4	dK
S Ind			*210516*			805	8.5	Dl	789	8.8	Jo	767	10.8	En	784	8.6	dK
204954			752	13.5	Ch	806	8.1	Hf	792	8.5	Dt	769	10.9	Bl	785	8.3	En
753	9.5	Bl	R Equ			806	7.7	Jo	795	8.5	Dt	772	11.4	dK	787	8.8	Ht
763	8.8	Bl	210812			806	7.7	Rb	796	9.3	Jo	778	11.7	dK	790	8.7	dK
767	8.9	Ht	798	11.1	Pt	806	8.1	Wd	797	10.7	Sf	784	11.7	dK	792	9.3	En
769	8.7	Bl	799	10.0	Jo	807	8.4	Dl	798	8.7	Pt	785	12.1	En	794	9.3	Ht
787	8.9	Ht	803	9.6	Jo	808	8.4	Dl	799	9.3	Jo	787	12.1	Ht	795	8.7	dK
794	9.1	Ht	805	9.5	Jo	808	8.1	Jo	800	8.5	Dt	794	12.2	Ht	RV Peg		
X Del			808	9.5	Jo	814	7.9	Ad	801	10.2	Je	VV Cep			*222129*		
205017			T Cep			814	7.5	Ba	803	8.5	Dt	215363			754[13.1		Ch
768	9.0	Ch	210868			814	8.4	Dl	803	10.2	Ch	788	5.5	Lt	807[12.8		Gy
784	9.7	Af	764	8.8	Ch	815	8.2	Dl	803	9.7	Jo	804	5.3	Lt	S Lac		
784	9.7	Fr	772	8.4	Ch	815	8.1	Hm	806	9.8	Jo	V Peg			222439		
785	9.6	Fr	773	8.9	Si	RR Aqr			806	10.9	Hf	215605			751	8.4	Cy
785	9.7	B	773	8.4	Pk	*210903*			807	11.1	Cy	754[13.5		Ch	753	8.7	Fn
785	9.9	Dh	773	9.0	Kp	771[13.2		Ch	808	9.8	Jo	797	13.3	Ch	777	7.8	Fn
787	10.0	Es	773	9.0	Fn	Y Pav			813	8.5	Dt	U Aqr			779	8.5	Lg
798	10.7	Pt	774	8.8	Kp	*211570*			RU Cyg			*215717*			783	7.6	Fn
799	10.4	Ch	775	8.5	Pk	767	5.8	Ht	*213753*			771[13.3		Ch	785	8.1	Hf
			776	8.8	Si	787	5.6	Ht	770	8.9	Je	802[13.4		Ch	786	7.8	Jo

Variable Star Observations Received During January, 1935.

J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.	J.D.	Est.	Obs.
S Lac			RW Peg			W Peg			ST And			R Aqr			R Cas		
222439			225914			231425			233335			233815			235350		
792	7.9	Hf	754	11.5	Ch	801	9.5	Jo	740	9.4	Cy	798	10.5	Kd	780	7.6	Ch
793	7.4	Es	766	11.8	Ch	805	9.6	Jo	754	9.0	Ch	798	10.3	Pt	783	8.9	Hf
794	7.0	Sx	783	12.2	Ar	806	10.0	Hf	783	9.1	Hf	798	10.5	Pk	785	9.0	Fr
794	7.8	Ra	797	12.8	B	808	9.6	Jo	785	5.2	Af	798	10.6	Si	786	8.5	B
802	8.3	Af	797	12.3	Wa	S Peg			785	9.4	Fr	799	11.3	Jo	792	8.9	Hf
802	8.5	Fr	797	12.3	Ch	231508			789	9.2	B	799	11.2	Rb	792	8.7	Wd
802	8.3	Lt	802	12.7	Ie	751	9.0	Cy	798	9.8	Pt	800	10.7	Ch	792	8.6	Sh
803	8.2	Jo	R Peg			754	8.7	Ch	798	8.8	Ch	801	11.5	Jo	794	9.0	Sx
805	8.3	Lt	230110			783	9.9	Hf	801	9.5	Fr	802	10.8	Gy	798	8.2	Ch
806	8.4	Hf	754	8.9	Ch	794	10.9	B	803	9.6	Jo	803	10.6	Kd	800	8.5	Wh
807	8.4	Cy	772	9.6	Ch	797	10.9	Ch	804	9.3	My	803	10.6	Sp	801	8.8	Je
807	8.2	B	783	10.2	Hf	798	11.1	Pt	806	9.1	Hf	803	11.5	Jo	801	8.5	Jo
R Ind			797	10.4	Ch	805	11.2	Hf	807	9.3	Cy	806	11.0	Rb	802	9.3	Kp
222867			797	11.1	Sf	815	11.4	Wd	808	9.3	Jo	807	10.8	Gy	802	9.2	Wd
753	10.4	Bl	798	10.7	Pt	RY Cep			R Aqr			807	10.4	Wa	803	9.0	B
763	10.4	Bl	801	11.0	Jo	231878			233815			807	10.5	Wp	805	9.2	Hf
767	10.8	En	802	10.4	Wd	771	10.5	Ch	741	10.0	Cy	810	10.8	Bj	805	8.6	Jo
767	11.1	Ht	804	11.3	My	795	9.6	Ch	753	10.0	Bl	Z Cas			807	9.4	Dl
769	11.0	Bl	805	11.3	Hf	V Phe			763	9.6	Bl	233956			808	8.7	Jo
787	12.3	Ht	815	11.4	Wd	232746			767	10.4	En	754	13.1	Ch	814	8.8	Jo
W Cep			V Cas			767	12.0	En	767	10.4	Ht	801	13.4	Po	Z Peg		
223257			230759			767	12.3	Ht	769	10.4	Bl	— Cas			235525		
788	8.4	Lt	754	11.6	Ch	794	13.2	Ht	770	10.4	Ch	234956			754	8.3	Ch
795	8.5	Lt	775	10.7	Cy	Z And			773	10.3	Pk	792	4.7	Lt	798	10.0	Ch
804	8.6	Lt	780	10.4	Ch	232848			773	10.2	Si	RR Cas			798	10.0	Pt
T Tuc			780	10.2	Sf	724	10.7	Cy	775	10.4	Pk	235053			801	10.3	Jo
223462			780	10.2	Wg	737	10.3	Cy	776	10.2	Hv	768	13.0	Ch	802	10.3	Mw
767	12.5	En	783	9.9	Fn	741	10.3	Cy	776	10.4	Pk	797	13.5	B	803	10.3	Jo
767	12.7	Ht	786	9.4	B	754	10.4	Ch	776	10.2	Si	814	13.9	Bs	808	10.7	Jo
787	12.8	Ht	789	9.8	Hf	775	10.4	Cy	776	10.0	Sd	V Cep			810	10.6	Mw
R Lac			797	8.8	Ch	776	10.7	Pb	777	10.4	Sd	235182			W Cet		
223841			797	9.2	Sf	776	10.7	Ar	777	10.3	Si	787	6.4	Lt	235715		
754	9.8	Ch	798	9.3	Si	782	10.7	Ar	777	10.4	Pk	792	6.4	Lt	798	13.7	Ch
766	10.0	Ch	798	8.9	Pt	783	11.2	Ar	778	10.5	Pk	802	6.4	Lt	Y Cas		
794	12.4	Ra	803	8.8	B	783	10.8	Hf	780	10.6	Ch	805	6.4	Lt	235855		
797	11.6	Ch	806	8.8	Hf	784	10.7	Pb	781	10.3	Pk	V Cet			754	12.8	Ch
801	12.7	Po	807	8.9	Sf	784	10.7	Ar	781	10.4	Hf	235209			798	13.5	B
S Aqr			807	8.6	Cy	785	10.7	Ar	782	10.4	Pk	770	13.8	Ch	SV And		
225120			814	8.4	Sh	795	10.7	Ar	786	10.3	Pk	798	12.1	Ch	235939		
790	7.8	Jo	814	8.6	Jo	798	10.7	Pb	786	10.9	Wa	806	11.6	Jo	731	10.3	Ma
796	8.0	Jo	W Peg			798	10.1	Pt	787	10.8	Ht	R Tuc			740	10.9	Cy
801	8.0	Jo	231425			798	10.5	Ch	789	10.7	Jo	235265			754	11.7	Ch
802	8.1	Fr	737	12.0	Cy	801	10.7	Pb	789	10.9	Rb	767	12.4	En	798	12.9	Ch
803	7.8	Jo	754	11.6	Ch	802	10.7	Pb	790	10.8	Jo	767	12.9	Ht	800	12.9	Bj
806	8.4	Jo	775	11.3	Cy	802	10.7	Ar	793	10.5	Wa	R Cas			801	13.1	B
808	8.2	Jo	783	9.9	Cl	806	10.6	Hf	793	10.5	Si	235350			805	13.4	Ie
			789	10.2	Hf	807	10.4	Cy	793	10.7	Wp	766	7.6	Ch	807	12.6	Cy
			794	9.9	Sx	808	10.5	Cy	794	10.8	Ht	774	8.4	Kp			
			797	9.7	Ch	814	10.4	Cy	796	11.0	Jo	777	7.9	Si			
			801	9.5	Fr				797	10.8	Bj						

Rapidly Varying Irregular Variables.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
005840 RX Andromedae—							005840 RX Andromedae—						
	7756.1	12.0	Ch	7782.6	10.7	Ar		7784.6	11.5	Ar	7789.4	11.3	Ry
	7775.2	13.1	Ch	7783.6	11.1	Af		7785.2	12.2	Ch	7790.4	11.3	Ry
	7779.4	13.2	Ry	7783.6	11.1	Ar		7785.6	12.9	Ar	7793.6	11.0	Wa
	7780.5	12.5	Ry	7784.5	11.8	Ry		7787.4	12.5	Ry	7793.6	11.1	Wp

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
005840 RX ANDROMEDAE—						
	7793.7	10.9	Es	7803.4	13.0	Ry
	7795.6	11.1	Ar	7807.6	10.5	Cy
	7796.4	11.7	Ry	7807.6	10.5	Gy
	7798.7	13.1	Pt	7807.6	10.8	Wa
	7800.2	13.0	Ch	7807.6	10.9	Wp
	7801.5	13.0	Ry	7808.6	10.8	Cy
	7801.6	12.8	Ar	7809.	11.6	
	7802.6	13.1	Wu	7814.6	11.4	Cy
	7802.6	13.0	Ar			
020356 UV PERSEI—						
	7802.7	[12.7	Gy			
060547 SS AURIGAE—						
	7076.4	14.2	Pd	7795.6	14.3	Ar
	7744.7	[12.5	Cy	7796.4	[12.5	Ry
	7749.7	[12.5	Cy	7797.5	[13.9	Wa
	7753.2	[12.5	Ch	7798.5	[13.9	B
	7757.2	[11.0	Ch	7799.6	15.0	Wa
	7757.9	[12.5	Cy	7800.7	[13.2	Hi
	7766.1	[12.5	Ch	7801.6	[14.5	Wp
	7769.6	[13.2	Cy	7801.6	15.0	Wa
	7771.2	[13.8	Ch	7802.6	[13.9	Ie
	7773.2	10.9	Ch	7803.4	[13.2	Ry
	7773.5	11.0	Fi	7804.7	[12.5	Pt
	7775.2	11.4	Ch	7805.6	15.1	Wa
	7775.7	11.8	Hi	7806.5	[13.9	Wa
	7776.6	12.5	Hi	7807.6	14.9	Wa
	7776.7	12.4	Ar	7807.7	[12.5	Pt
	7777.7	13.0	Hi	7808.6	14.7	Wa
	7779.5	[13.2	Ry	7811.7	[12.5	Pt
	7780.1	13.9	Ch	7813.7	11.0	Pt
	7782.6	14.8	Ar	7814.5	11.2	Cy
	7783.6	14.5	Ar	7814.6	11.2	Wp
	7784.6	14.7	Ar	7814.6	11.4	Wa
	7785.6	14.7	Ar	7814.6	11.2	Wa
	7786.6	14.5	Wa	7814.6	11.3	Ie
	7787.4	[12.5	Ry	7814.6	11.1	Fi
	7789.6	[12.8	B	7815.6	11.4	Gy
	7793.6	[13.2	Wa	7815.5	12.0	Ie
	7794.6	[12.3	Ra	7815.5	11.5	Wp
074922 U GEMINORUM—						
	7746.9	14.1	Ma	7799.2	14.0	Ch
	7749.9	14.3	Ma	7799.6	13.5	Cm
	7752.8	14.3	Ma	7799.7	13.8	Ar
	7753.2	[10.9	Ch	7800.2	10.9	Ch
	7756.8	14.3	Ma	7801.2	9.2	Ch
	7757.9	[12.4	Cy	7802.2	9.5	Ch
	7758.5	[10.9	Ch	7802.7	9.8	Mw
	7773.2	[13.3	Ch	7802.6	9.8	Bj
	7775.6	[12.4	Cy	7802.7	9.5	Ie
	7776.2	[13.3	Ch	7802.7	9.4	Gy
	7777.7	14.2	Ma	7802.7	9.8	Ar
	7780.8	[12.4	Pk	7802.8	9.6	Hf
	7782.6	14.0	Ar	7803.1	9.4	Ch
	7783.6	14.0	Ar	7803.6	9.8	Sp
	7784.7	14.0	Ar	7804.6	10.6	Bj
	7785.7	14.0	Ar	7805.6	11.2	Hf
	7785.3	14.0	Ch	7805.7	11.3	Pt
	7786.6	[13.3	Wa	7806.6	12.4	Wd
	7789.7	[11.9	Gy	7806.6	12.5	Ie
	7798.6	[13.5	B	7806.7	12.5	Mw
074922 U GEMINORUM—						
	7807.6	13.5	Wp	7812.7	13.3	Sp
	7807.6	13.5	Ie	7813.7	[12.4	Pt
	7807.6	13.4	Wa	7814.6	[13.8	Wp
	7808.6	13.9	Wa	7814.6	14.0	Wa
	7808.6	14.0	Wp	7814.9	14.0	Ie
	7810.7	[12.5	Mw	7815.6	[13.0	Wd
	7811.7	[12.4	Pt			
081473 Z CAMELOPARDALIS—						
	7749.7	12.5	Cy	7798.6	10.8	Pt
	7757.9	12.1	Cy	7799.6	11.7	Wa
	7775.6	11.2	Cy	7801.5	11.4	Ry
	7779.4	11.6	Ry	7801.6	11.6	Ar
	7780.5	11.6	Ry	7802.6	11.4	Ar
	7782.6	13.2	Ar	7802.7	11.7	Gy
	7783.4	13.0	Ry	7803.4	11.7	Ry
	7783.6	13.0	Ar	7804.6	12.8	Pt
	7784.5	12.8	Ry	7805.5	[12.0	Jo
	7784.7	13.0	Ar	7807.5	12.7	Gy
	7785.6	12.5	Ar	7807.6	12.8	Pt
	7786.6	13.2	Wp	7807.6	12.6	Wa
	7786.6	13.2	Wa	7807.6	12.8	Wp
	7787.4	12.9	Ry	7808.6	14.0	Wp
	7789.7	[11.9	Gy	7814.6	12.5	Wa
	7793.6	12.5	Wa	7814.6	12.7	Fi
	7793.6	12.3	Wp	7814.6	12.4	Wp
	7795.6	10.6	Ar	7814.6	12.0	Cy
	7796.4	10.7	Ry	7815.6	12.7	Wa
	7798.6	10.9	Ar	7815.6	12.8	Wp
094512 X LEONIS—						
	7789.7	[11.8	Gy	7811.7	[11.8	Pt
	7802.7	[12.6	Gy			
180445 NOVA HERCULIS—						
	7786.5	3.2	Wa	7790.4	2.1	Kd
	7786.5	3.4	Si	7790.5	2.6	Mg
	7786.5	3.1	Mg	7790.5	2.3	Lg
	7786.5	3.4	Lg	7790.5	2.6	Wa
	7786.9	3.4	Jb	7790.5	2.5	SG
	7787.0	3.2	Mg	7791.2	2.0	L
	7787.5	3.2	Si	7791.4	2.6	Hm
	7787.5	2.6	Lg	7791.5	2.5	Mg
	7787.5	3.4	Jb	7791.5	2.3	SG
	7787.9	2.8	Kd	7791.5	2.3	Bb
	7788.3	2.4	Kd	7791.5	2.0	Lg
	7788.5	2.6	Mg	7791.6	2.3	Pt
	7789.0	2.5	Ar	7791.9	2.3	Kd
	7789.5	2.3	Hu	7792.2	2.3	Mh
	7789.5	2.8	Wa	7792.3	1.8	Kd
	7789.5	2.6	Si	7792.4	2.1	Hm
	7789.5	2.4	Hf	7792.5	2.2	Wa
	7789.5	2.6	Hu	7792.5	1.9	Hf
	7789.5	2.4	Hu	7792.5	1.9	SG
	7789.5	2.9	Dl	7792.5	2.1	Mg
	7789.5	2.7	Si	7792.5	2.0	Wd
	7789.5	2.8	Hm	7792.5	2.1	Lg
	7789.6	2.6	Hu	7792.5	2.3	Bb
	7789.9	2.8	Kd	7792.5	2.0	Sf
	7789.9	2.9	Jb	7792.5	1.9	Jo
	7789.9	2.2	Sf	7792.5	2.1	Hc
	7790.2	2.6	Mh	7792.5	2.0	Si
	7790.2	2.4	L	7792.9	1.8	Jb

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
180445 NOVA HERCULIS—							180445 NOVA HERCULIS—						
	7792.9	1.9	Kd	7796.6	1.8	Sx		7799.4	2.2	Sp	7802.5	2.6	Si
	7792.9	1.9	SG	7796.6	2.4	Bz		7799.4	2.1	Kd	7802.5	2.7	Jo
	7793.4	1.9	Hm	7796.6	3.0	Ra		7799.5	1.8	Si	7802.5	3.0	Cl
	7793.5	1.7	Wa	7796.6	2.5	Hi		7799.5	2.2	Jo	7802.5	2.3	Hu
	7793.5	1.5	Mg	7796.9	2.8	Kd		7799.5	2.9	Cl	7802.5	2.7	Wd
	7703.5	1.6	Hf	7797.3	2.4	Kd		7799.5	1.9	Cm	7802.5	2.6	SG
	7793.5	2.0	Dl	7797.5	2.5	Wp		7799.5	2.4	SG	7802.5	2.8	Jb
	7793.5	1.4	Mb	7797.5	2.4	Lg		7799.5	2.5	Jb	7802.5	3.0	Pb
	7793.5	1.3	Bb	7797.5	3.0	O		7799.5	2.3	Sw	7802.5	2.8	Dl
	7793.5	1.4	Lg	7797.5	3.4	B		7799.5	2.1	Dl	7802.5	2.6	Lf
	7793.5	1.7	Sf	7797.5	2.5	Ko		7799.5	2.5	Ko	7802.5	2.5	Hk
	7793.5	1.6	SG	7797.5	2.5	Sf		7799.5	2.0	Wa	7802.5	2.7	Dh
	7793.6	2.0	La	7797.6	2.8	Hi		7799.5	2.4	Kp	7802.5	2.7	Fr
	7793.6	1.6	Pt	7797.6	2.6	Wa		7799.5	1.9	Hf	7802.5	2.7	Ar
	7793.6	1.5	SH	7798.0	3.5	Fn		7799.5	2.3	Sf	7802.5	2.7	Af
	7793.7	1.4	Bz	7798.2	3.0	L		7799.5	3.1	Dh	7802.5	2.4	Hf
	7794.5	1.5	Wd	7798.4	3.2	Hm		7799.5	2.2	Ba	7802.5	2.8	Gy
	7794.5	2.0	Dl	7798.5	3.3	Si		7799.5	2.1	Gy	7802.5	2.6	Hv
	7794.5	1.6	Si	7798.5	3.5	Jo		7799.5	2.4	Wp	7802.5	2.5	Wp
	7794.5	1.4	Sf	7798.5	3.2	Hq		7799.5	2.4	Wd	7802.5	2.6	Sw
	7794.5	1.5	Mg	7798.5	3.2	Hv		7799.9	2.1	SG	7802.5	2.6	Wa
	7794.5	1.4	Mb	7798.5	2.8	Gy		7800.2	2.6	L	7802.5	2.4	Kp
	7794.5	1.0	Bb	7798.5	3.1	Dl		7800.5	3.2	Hu	7802.5	2.8	Kg
	7794.5	1.2	Lg	7798.5	3.2	Lf		7800.5	3.3	Hu	7802.5	2.8	O
	7794.5	1.6	Fn	7798.5	3.2	Fr		7800.5	2.1	Mb	7802.5	2.7	Rb
	7794.5	1.8	Wa	7798.5	3.2	Ar		7800.5	2.1	Bb	7802.5	2.6	Bc
	7794.5	2.0	Jb	7798.5	2.3	Mg		7800.5	2.2	Jb	7802.6	2.6	Hi
	7794.6	1.9	Pt	7798.5	3.0	O		7800.5	2.2	Mg	7802.6	2.1	Lr
	7794.7	1.9	Ad	7798.5	3.2	B		7800.6	2.8	H	7802.6	2.5	Mc
	7795.0	1.5	Si	7798.5	2.9	Wa		7800.6	2.3	Mc	7802.6	2.9	Ra
	7795.0	1.6	Fn	7798.5	3.6	Wd		7800.6	3.0	Sx	7802.6	2.4	Hu
	7795.2	2.0	L	7798.5	3.0	Wp		7800.8	2.3	Rc	7802.6	2.5	Hu
	7795.3	2.2	Mh	7798.5	3.3	Jb		7801.3	3.0	Kd	7802.6	2.6	Bc
	7795.5	2.1	Hv	7798.5	3.0	Hf		7801.5	2.6	Ma	7802.8	2.5	Gy
	7795.5	1.5	Si	7798.5	3.1	Sf		7801.5	3.7	Jo	7802.9	2.2	Ba
	7795.5	1.4	Cl	7798.5	3.2	Kp		7801.5	3.0	Jb	7803.4	2.5	Sp
	7795.5	2.2	Hu	7798.5	2.9	Pb		7801.5	3.2	SG	7803.5	2.4	Mz
	7795.5	2.1	Hu	7798.6	3.6	By		7801.5	3.0	Hm	7803.5	2.3	C
	7795.5	2.1	Jb	7798.6	3.6	Si		7801.5	3.0	Wa	7803.5	2.2	Jo
	7795.5	2.1	Lf	7798.6	2.8	Bz		7801.5	3.0	Sf	7803.5	2.6	Hm
	7795.5	2.1	Dh	7798.6	2.6	Sq		7801.5	2.6	Kg	7803.5	2.6	Rb
	7795.5	2.1	Mb	7798.6	2.5	Kg		7801.5	3.0	Gy	7803.5	2.7	O
	7795.5	2.1	Fr	7798.6	2.3	Pt		7801.5	3.4	Lf	7803.5	2.2	Aw
	7795.5	2.1	Ar	7798.6	3.1	Hu		7801.5	3.4	Fr	7803.5	2.8	Hw
	7795.5	1.9	Mg	7798.6	3.2	Hv		7801.5	3.4	Ar	7803.6	2.3	Sx
	7795.6	2.0	Bc	7798.6	2.8	Bc		7801.5	3.2	Hv	7803.6	2.3	Hu
	7795.6	2.0	Hv	7798.9	2.0	Kd		7801.5	3.1	Dl	7803.6	2.5	Ad
	7795.6	2.1	Af	7798.9	3.2	Si		7801.5	3.3	Pb	7803.6	2.5	Hi
	7795.6	2.0	Ad	7798.9	2.4	SG		7801.5	3.7	B	7803.6	2.9	Ra
	7795.6	2.0	Hu	7798.9	2.2	Ba		7801.5	2.9	Ko	7803.8	2.0	Hu
	7796.4	1.9	Hm	7798.9	2.1	Rb		7801.5	3.0	Kp	7803.9	1.9	Kd
	7796.5	2.0	Jo	7799.0	2.4	Fn		7801.5	3.4	Dh	7803.9	3.4	Si
	7796.5	2.3	Ba	7799.0	2.4	Si		7801.5	3.4	Hk	7803.9	3.2	Si
	7796.2	2.3	Wd	7799.0	2.5	Si		7801.6	3.1	Hi	7803.9	3.0	Si
	7796.5	2.0	Kg	7799.0	2.7	Si		7801.9	2.7	Kd	7804.0	2.5	Fn
	7796.5	2.1	Gy	7799.0	2.3	Hn		7802.1	1.5	Ie	7804.0	2.7	Si
	7796.5	2.2	Dl	7799.1	1.9	Cm		7802.4	2.7	Hm	7804.0	2.6	Fn
	7796.5	2.1	Rb	7799.3	2.1	Kd		7802.4	2.5	Sp	7804.0	2.7	Fn
	7796.5	2.4	Hf	7799.4	2.4	Rb		7802.4	2.7	Hm	7804.1	2.3	Ie
	7796.5	2.4	Kp	7799.4	2.2	Hm		7802.5	2.4	Ma	7804.1	2.5	Si

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
180445 NOVA HERCULIS—						
	7804.4	2.1	Kd	7806.5	2.6	Cu
	7804.5	3.0	C	7806.6	2.6	Kg
	7804.5	2.8	Kg	7806.6	2.5	Lr
	7804.5	2.6	Mg	7806.8	2.4	Rc
	7804.5	2.3	Hf	7806.9	2.5	Cu
	7804.5	2.7	Ko	7806.9	2.2	Kd
	7804.5	2.7	Wa	7806.9	2.0	Ie
	7804.5	3.0	O	7806.9	2.6	SG
	7804.5	2.6	Dl	7807.1	2.3	Ie
	7804.5	2.7	Hm	7807.2	2.8	Mh
	7804.5	2.5	Wp	7807.4	2.6	Hm
	7804.5	2.9	Ba	7807.4	1.9	Ch
	7804.5	2.4	SG	7805.5	2.4	Ma
	7804.5	2.5	Jo	7807.5	2.3	Jo
	7804.5	2.3	Rb	7807.5	2.6	C
	7804.6	2.7	Bb	7807.5	2.6	Mz
	7804.6	2.8	Hi	7807.5	2.7	SN
	7804.6	2.3	Pt	7807.5	2.3	Aw
	7804.9	2.6	Kd	7807.5	2.6	Rb
	7804.0	2.2	Rb	7807.5	2.6	Wa
	7805.0	2.7	Fn	7807.5	2.7	Sf
	7805.0	2.8	Fn	7807.5	2.7	Gy
	7805.0	2.6	Mg	7807.5	2.2	Dl
	7805.0	2.6	Cm	7807.5	2.9	Bb
	7805.4	2.7	Ko	7807.5	2.5	Mo
	7805.5	2.3	Hf	7805.2	2.4	Hf
	7805.5	2.8	Fn	7807.5	2.8	Mg
	7805.5	2.6	Fn	7807.5	2.7	Fn
	7805.5	2.7	Sf	7807.5	2.6	Wp
	7805.5	2.4	Dl	7807.5	2.4	Wd
	7805.5	2.6	Wa	7807.5	2.7	Ba
	7805.5	2.7	Hm	7807.5	2.7	SG
	7805.5	2.6	Wd	7807.6	2.6	Lr
	7805.5	2.6	Wp	7807.9	2.1	Cy
	7805.5	2.5	Ba	7807.9	2.7	Kd
	7805.5	2.0	Jo	7808.0	1.8	Ch
	7805.5	2.6	C	7808.0	2.6	Cm
	7805.5	2.4	Ma	7808.0	2.2	Rb
	7805.5	2.7	Aw	7808.2	2.7	Mh
	7805.5	2.6	SG	7808.4	2.4	Gy
	7805.5	2.5	Cf	7808.4	2.2	Kd
	7805.5	2.8	Hw	7808.5	2.4	Cf
	7805.6	2.8	Hi	7808.5	2.5	Wp
	7805.6	2.4	Pt	7808.5	2.7	Ko
	7805.8	2.5	Rc	7808.5	2.5	Rb
	7805.9	3.0	Cu	7808.5	2.7	Fn
	7805.9	2.5	SG	7808.5	2.6	Fn
	7806.0	2.3	Rb	7808.5	2.1	Dl
	7806.4	2.6	Rb	7808.5	2.5	Wa
	7806.5	2.8	C	7808.5	2.4	Hm
	7806.5	2.4	Ma	7808.5	2.6	Wd
	7806.5	2.7	Wa	7808.5	2.6	Ba
	7806.5	2.5	Dl	7808.5	2.5	SG
	7806.5	2.7	Hf	7808.5	2.4	Jo
	7806.5	2.7	Hm	7808.5	2.4	C
	7806.5	2.6	Wp	7808.8	2.4	Rc
	7806.5	2.8	Wd	7809.5	2.0	Ch
	7806.5	3.0	Ba	7809.6	3.0	Ra
	7806.5	3.0	SG	7809.9	2.1	Kd
	7806.5	2.4	Jo	7810.4	2.1	Kd
180445 NOVA HERCULIS—						
	7810.5	3.2	B	7815.5	2.4	Wa
	7810.5	2.4	Jo	7815.5	2.5	Wp
	7810.8	2.0	Rc	7815.5	2.3	Ba
	7810.9	2.2	Kd	7815.5	2.6	SG
	7810.9	2.5	Cu	7815.5	2.0	Jo
	7811.1	2.2	Ra	7815.5	2.3	C
	7811.4	1.9	Kd	7815.5	2.3	Mz
	7811.5	2.1	Ch	7815.5	2.4	Hw
	7811.6	2.3	Sx	7815.5	2.0	Ch
	7811.8	2.1	Rc	7816.5	2.3	Ma
	7812.0	2.3	Sx	7816.5	2.5	Cm
	7812.1	2.4	Ra	7816.8	2.4	Rc
	7812.6	2.7	Pt	7817.8	2.5	Rc
	7812.6	2.6	Bz	7817.9	1.9	Cy
	7812.8	2.2	Rc	7818.5	2.5	C
	7813.1	2.2	Ra	7818.5	2.7	Aw
	7813.4	2.2	Kd	7815.5	2.6	SG
	7813.5	2.3	Ch	7818.6	3.0	Bz
	7813.5	2.8	Wa	7819.5	3.0	Mr
	7813.6	2.5	Sx	7819.5	3.0	SG
	7813.8	2.2	Rc	7820.5	2.3	Ma
	7813.9	2.5	Ie	7821.5	2.4	C
	7813.9	2.4	Pt	7821.5	2.0	Hw
	7813.9	2.7	Cm	7821.5	2.1	To
	7814.4	2.7	Ko	7821.5	2.4	SG
	7814.4	2.5	Hm	7821.5	2.4	Mr
	7814.4	2.6	Bs	7821.5	2.3	Ko
	7814.5	2.6	Jo	7821.6	2.1	Bz
	7814.5	2.6	C	7821.8	1.9	Sg
	7814.5	2.5	Ba	7822.5	2.5	C
	7814.5	2.3	Dl	7822.5	2.0	Hw
	7814.5	2.6	Gy	7822.5	2.1	SG
	7814.5	2.4	Kg	7822.5	2.1	Mz
	7814.5	2.5	Sf	7822.5	2.7	To
	7814.5	2.5	Wa	7822.6	2.1	Bz
	7814.5	2.4	Wd	7827.5	2.9	C
	7814.5	2.6	SG	7827.5	2.5	Cf
	7814.5	2.5	Bc	7830.5	2.5	SG
	7814.5	2.6	Hw	7830.5	2.5	Hw
	7814.5	2.6	Mz	7830.5	2.7	To
	7814.5	2.4	Ma	7830.5	2.3	Aw
	7814.6	2.5	Ad	7830.5	2.5	C
	7814.6	2.0	Sx	7830.5	2.5	Ba
	7814.9	2.4	SG	7830.8	2.1	Hy
	7814.9	2.3	Ie	7830.9	2.2	Y
	7814.9	2.0	Dl	7830.9	2.4	SG
	7815.0	2.0	Sx	7832.8	3.6	Hy
	7815.4	2.5	Ko	7832.8	3.6	Ba
	7815.4	2.2	Hm	7832.9	3.1	Y
	7815.5	2.0	Dl	7833.9	3.7	SG
	7815.5	2.3	Gy	7834.5	3.6	To
	7815.5	2.2	Gy	7834.5	3.7	Hw
	7815.5	2.3	Kg	7834.5	3.1	SG
	7815.5	2.3	Sf	7834.9	3.2	SG
202946 SZ CYGNI—						
	7794.6	9.1	Pt	7807.7	8.9	Pt
	7798.6	9.9	Pt	7811.7	9.8	Pt
	7804.6	8.9	Pt	7813.7	9.8	Pt
	7805.6	8.8	Pt			

VARIABLE STAR OBSERVATIONS RECEIVED DURING JANUARY, 1935.

Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.	Star	J.D.	Est.	Obs.	J.D.	Est.	Obs.
213843 SS CYGNI—							213843 SS CYGNI—						
	7751.2	11.8	Ch	7783.5	8.9	Fr		7793.6	11.7	Wp	7802.6	12.3	Ar
	7754.2	11.9	Ch	7783.5	8.8	Hf		7793.6	11.8	Wa	7802.6	12.3	Dh
	7757.6	12.0	Cy	7783.6	8.4	Fn		7793.6	11.6	Es	7802.6	12.1	Wd
	7764.1	11.9	Ch	7783.6	8.9	Ar		7794.5	10.9	Fn	7802.6	12.2	Lf
	7767.5	12.0	Mg	7783.7	8.7	Si		7794.5	11.2	B	7802.7	12.0	Es
	7767.6	11.9	Ma	7784.5	8.5	Si		7794.6	11.0	Ra	7803.0	11.9	Ch
	7768.1	11.7	Ch	7784.6	8.7	Af		7794.6	11.6	Pt	7803.5	12.0	B
	7768.6	11.9	Mg	7784.5	8.7	Pb		7795.0	11.8	Ch	7803.5	12.1	Jo
	7769.6	11.5	Cy	7784.6	8.7	Ar		7795.5	11.9	Fr	7804.0	11.9	Ch
	7770.6	11.7	Ar	7784.6	8.6	Fr		7795.6	12.0	Lf	7804.6	11.7	Pt
	7771.1	11.7	Ch	7785.5	8.8	Fr		7795.6	12.0	Af	7805.5	11.9	Jo
	7773.1	11.7	Ch	7785.5	8.8	B		7796.5	11.0	Jo	7805.5	12.2	Wa
	7773.6	11.0	Fi	7785.5	8.7	Hf		7797	11.9	Bj	7805.5	12.0	Hf
	7773.6	11.0	Si	7785.6	8.9	Dh		7797.5	12.0	B	7805.6	12.2	Wp
	7773.7	12.2	Pk	7785.6	8.9	Af		7797.5	12.2	Wa	7805.7	11.8	Pt
	7774.1	11.4	Ch	7785.6	8.9	Ar		7798.5	12.1	Wd	7806.5	12.1	B
	7775.5	10.9	Cy	7785.7	8.8	Ar		7798.5	12.0	Pb	7806.5	12.0	Hf
	7775.6	10.8	Si	7786.5	9.2	Io		7798.6	12.1	Pk	7806.5	12.2	Rb
	7775.7	11.9	Pk	7786.6	8.8	Si		7798.6	12.0	Fr	7806.5	12.2	Wa
	7776.1	11.3	Ch	7786.6	9.0	B		7798.6	11.7	Pt	7806.5	12.0	Wd
	7776.6	11.7	Pb	7786.6	9.0	Wa		7798.6	12.0	Lf	7806.5	11.9	Jo
	7776.6	11.5	Ar	7786.6	9.0	Wp		7799.1	11.9	Ch	7806.5	12.0	Cm
	7776.6	11.6	Fr	7786.6	8.9	Pk		7799.5	12.2	Rb	7807.5	12.1	B
	7776.6	11.7	Dh	7786.6	9.2	Sx		7799.5	12.2	Wa	7807.5	12.0	Hf
	7776.7	11.9	Pk	7787.5	9.3	Jo		7799.5	12.0	Jo	7807.5	12.2	Wa
	7777.5	10.5	Si	7787.6	9.5	Sx		7799.6	11.9	Cm	7807.5	12.3	Wp
	7777.6	11.5	Pk	7787.6	9.3	Es		7800.6	11.8	Ra	7807.6	12.4	Cy
	7777.7	10.9	Fn	7787.6	9.3	Ra		7801.5	12.1	Po	7807.6	12.2	Gy
	7777.7	11.7	Ma	7787.8	9.2	Pk		7801.5	12.1	Hk	7807.7	11.7	Pt
	7778.6	10.5	Pk	7788.0	9.2	Ch		7801.5	12.1	Pb	7808.5	12.0	Jo
	7779.6	10.1	Pk	7788.5	10.2	Bs		7801.5	12.0	B	7808.5	12.3	Wa
	7780.2	9.6	Ch	7788.6	9.5	Es		7801.5	12.1	Fr	7808.5	12.3	Wp
	7780.8	9.7	Pk	7788.8	9.6	Pk		7801.6	12.2	Wp	7808.6	12.0	Cy
	7781.5	9.6	Hf	7789.5	9.5	Cm		7801.6	12.2	Ar	7810	11.8	Bj
	7781.7	9.1	Pk	7789.5	10.2	B		7801.6	12.2	Wa	7810.5	12.1	B
	7782.2	9.3	Ch	7789.5	9.8	Hf		7802.7	11.8	Hu	7811.7	11.7	Pt
	7782.5	9.0	Af	7789.5	9.6	Jo		7802	11.8	Bj	7813.7	11.7	Pt
	7782.5	9.0	Lf	7789.6	10.2	Rb		7802.5	12.2	Fr	7814.5	11.9	Cy
	7782.6	9.3	B	7790.0	9.9	Ch		7802.5	12.1	Pb	7814.5	12.1	Wp
	7782.6	9.1	Si	7790.5	10.4	Jo		7802	12.0	Hv	7814.5	12.2	Fi
	7782.6	9.4	Ar	7790.6	10.2	Pk		7802.5	12.0	Af	7814.6	12.2	Wa
	7782.8	8.9	Pk	7791.6	10.7	Pk		7802.6	12.0	Bc	7815.5	12.0	Jo
	7783.0	9.0	Ch	7793.5	10.9	Si							

SUMMARY FOR JANUARY, 1935.

Observer	Initial	Vars.	Observations	Observer	Initial	Vars.	Observations
Aldwell	Ad	7	16	Brown, S. C.	Bs	26	27
Andrews	Aw	1	5	Brydon	Bz	1	7
Armfield, D.	Af	24	52	Buckstaff	Bc	7	12
Armfield, F.	Ar	35	174	Callum	Cl	4	7
Baldwin	Bl	69	147	Campbell	C	1	13
Ballhaussen	Ba	7	21	Chandra	Ch	226	518
Belsham	Bj	43	52	Christman	Cm	31	46
Blunck	Bu	3	10	Cilley	Cy	39	100
Bouton	B	59	95	Cuffey	Cf	1	3
Brady	By	11	14	Cunningham	Cu	1	4
Brown, R.	Bb	1	7	Dalton	Dt	1	8

SUMMARY FOR JANUARY, 1935—Continued.

Observer	Initial	Vars.	Observations	Observer	Initial	Vars.	Observations
Diedrich	Dh	18	56	Marchesini	Mh	2	10
Doolittle	Dl	19	99	Marsh	Ma	20	33
Ellis	Es	10	13	Marshall	Mr	1	2
Ensor	En	31	37	McKnelly	My	16	16
Field	Fi	13	17	McLeod	Mc	10	13
Fish	Fs	5	7	Menzel	Mz	1	5
Focas	Fc	70	160	Miller	Mw	22	55
Ford	Fd	9	9	Monnig	Mg	5	24
Frister	Fr	46	120	Moore	Mo	3	4
Friton	Fn	26	63	Morse	Mb	1	4
Gaposchkin,S.	SG	1	29	Olcott	O	2	10
Gregory	Gy	65	109	Peck	Pb	18	37
Halbach	Hk	43	58	Peltier	Pt	138	172
Hamilton	Hm	9	65	Perkinson	Pk	14	56
Harper	Hq	5	5	Plakidis	Pd	2	2
Hartmann	Hf	79	175	Poole	Po	6	6
Harwood	Hw	1	8	Popkavich	Pv	4	4
Hassler	Hz	1	3	Preucil	Pf	13	13
Heines	Hh	9	10	Previll	Pm	1	5
Henry	Hy	1	2	Raphael	Ra	54	66
Hickerson, F.	Hn	1	1	Recinsky	Rc	5	15
" J. F.	Hc	1	1	Rosebrugh	Rb	17	57
Hildom, A.	Hi	15	22	de Roy	Ry	9	36
Holt	Hb	7	9	Salanave	Sx	33	46
Howes	Hv	10	34	Seely	Sa	1	2
Houston	Hu	9	26	Shaw	SH	1	1
Houghton	Ht	50	75	Shinkfield	Sl	10	15
Huruhata	Hr	1	3	Simpson,A.M.	Sd	7	15
Iedema	Ie	27	37	Simpson,J.W.	Si	41	128
Jacobs	Jb	1	11	Smith, A. P.	Sp	17	20
Jansen	Je	10	14	Smith, F. P.	Sq	9	9
Jones	Jo	112	387	Smith, F. W.	Sf	14	31
Kaho	Ka	1	4	Smith, L.	Sh	16	17
Kanda	Kd	21	116	Sterne	SN	1	1
King	Kg	8	20	Swansen	Sw	1	3
Kirkpatrick	Kp	13	58	Thomas	To	1	4
de Kock	dK	15	63	Wade	Wh	9	9
Kohman	Ko	1	9	Walton	Wu	3	3
Lacchini	L	1	5	Watson	Wa	20	96
Lawton	La	1	1	Webb	Wd	45	93
Loepfe	Lf	6	13	Williams'n,A.	Wg	3	4
Logan	Lg	4	11	Woods	Wp	16	54
Loreta	Lt	29	66	Young	Y	1	2
Luechinger	Lr	1	4				
				Totals		109	417	4570

servers and practically every night is represented by observations since the announcement of the discovery of the star. This has proved one of the most interesting of the Novae discovered this century, partly from the fact that it has remained at naked eye visibility for so many weeks. It has been hovering practically between second and third magnitude since late in December. The exception occurred late in January when it dropped to magnitude 3.8.

Nova charts of the "b" type are now available for distribution to observers upon application to the Recorder.

According to information just received from the Milwaukee Observers R Cor Bor, after a short standstill and slight rise late in December, suddenly dropped to magnitude 12.0 on January 26.

SS Cygni was on the rise to maximum, magnitude 10.0, on February 2, four days later than the predicted date.

LEON CAMPBELL, Recorder.

February 11, 1935.

Meteor Notes from the American Meteor Society

By CHARLES P. OLIVIER, President

In the annual report of the American Meteor Society for 1934, several things deserve particular mention. First in importance is the great development of several of our sections, each consisting of one or more states or parts of states. This means that in these regional groups our observers no longer have to work alone, without guidance or assistance except what could be furnished from headquarters. The observer is no longer isolated; he may take part in coöperative work with others interested in the same problems. He can personally see or at least more easily communicate with his regional director, who, being near at hand, is more competent to settle many questions of local policy than anyone at headquarters, perhaps thousands of miles away, can possibly be. Consequently coöperative work is now a usual thing rather than a rarity, with increased efficiency in observing and better results obtainable from the recorded data. The regional directors also lift much of the burden of routine from headquarters. Were it not for their able assistance the resources of the Flower Observatory staff would be taxed beyond limit by the work annually reported. Even as it is, we are far behind in finishing the computations necessary for some of the observations long since submitted.

The totals for our annual report of observations show a decrease in most of the categories compared to 1933. This is caused by several factors: (1) very bad weather over much of the country cut down by many thousands the number of Perseids reported; (2) the Leonids failed to return in good numbers, and fewer people tried to observe them; (3) our principal Arizona observer, J. D. Williams, after the first part of 1934 temporarily discontinued his intensive meteor program of 1933 which, so far as we know, had set a world record for any one observer.

Two special meteor observing campaigns are further contributing causes for the decrease in reported observations. With the full approval of headquarters, many of our observers took part in the Byrd Antarctic Expedition program. Copies of these observations are eventually to become the property of the American Meteor Society, by agreement with Professor Poulter when our aid was enlisted, but they do not appear in our tables because they have not as yet been received. Also observations made on the new Hoffmeister-Olivier program, which started in the last two months of the year, have been very incompletely reported to us.

In spite of the smaller total, we believe that there has been no decrease in interest of our members and helpers. We have, on the other hand, a great increase in the number of telescopic meteors, due mostly to a remarkable series of observations by R. Knabe. The results of this work, still in progress, will be very valuable. Much more attention is being paid to meteor photography by our members, which will bring eventual results adding greater accuracy to meteoric research. The number of fireballs remains about the same. We continue to make strenuous efforts to enlist the active coöperation of persons on land and sea who are competent to make useful reports.

Thanks to coöperative work reported to headquarters, the heights of 246 meteors were computed and published in 1934. A special campaign for the Leonids last November was a failure so far as anything spectacular was concerned, but

a number of heights will be derived. As usual, throughout the year the press was helpful in publishing requests for observations and meteoric information generally. The assistance so given is invaluable in this field.

Our membership list shows 23 associate members and 201 active members now on the rolls of the Society. No effort is made to have anyone join who is not actively interested. We have every reason to expect that 1935 will show a steady increase in efficiency and progress.

TABLE I.

Name and Station	Nights	Meteors
Alpha Nu Fraternity, Alpha Chapter, Boulder, Colorado	3	115
Alpha Nu Fraternity, Beta Chapter, Denver, Colorado	3	1083*‡
Alpha Nu Fraternity, Gamma Chapter, Harrogate, Tennessee	7	141
Binckley, R. A., Upper Darby, Pennsylvania	3	51
Black, J. L., Cleveland, Ohio	14	205
Bowman, E. F., Raytown, Missouri	1	334*‡
Braun, M. L., Salisbury, North Carolina	2	132
Brinegar, D. F., Tucson, Arizona	8	268
Bunch, S., Knoxville, Tennessee	8	199†
Bunch, Mrs. S., Knoxville, Tennessee	2	133*
Deutsch, A., Muskegon, Michigan	4	67
Dole, R. M., and Holt, W. L., Scarboro, Maine	1	98†
Ford, Miss M., Norman, Oklahoma	12	89
Friton, E. E., St. Louis, Missouri	37	1015†
Harper, R., Kirkwood, Missouri	33	549*
Harrell, B. L., Gadsden, Alabama	1	67
Hellweg, C. F., St. Louis, Missouri	3	78*
Jewett, Miss M. L., Grandview, Tennessee	6	122*
Khan, Mohd. A. R., Begumpet, Deccan, India	24	167*
Kirkpatrick, G. P., Piermont, New York	17	250
Knabe, R., El Centro, California	25	1304
Lamb, J. E., Regina, Saskatchewan, Canada	22	457
La Paz, L., Westerville, Ohio	1	73
Loreta, E., Bologna, Italy	11?	150
Louisville Astronomical Society, Louisville, Kentucky	6	577*‡
Marsh, F. F., Frederick, Maryland	2	44
McIntosh, R. A., Auckland, New Zealand	15	225
Monnig, O. E., Ft. Worth, Texas	4	70*
Niebuhr, V. J., Reedsburg, Wisconsin	5	71
Olivier, C. P., Upper Darby, Pennsylvania	4	68
Pannill, H., Burleson, Texas	3	433*
Parker, P. O., Cohutta, Georgia	4	74
Peck, A. L., Milwaukee, Wisconsin	8	184
Persons, W. J., Kalamazoo, Michigan	6	179
Preucil, F., Joliet, Illinois	9	417*‡
Pruett, J. H., Eugene, Oregon	2	191*
Reed, R. G., Fall River, Massachuetts	2	48†
Rhode Island Amateur Astronomical Society, Providence, R. I.	2	118*‡
Riggs, W., Pelly, Texas	2	56
Ridley, G. W., San Francisco, California	2	542*
Rupert, S., Exeter, California	2	169*
Simpson, J. W., Webster Groves, Missouri	76	2319
Smith, F. W., Glenolden, Pennsylvania	33	300
Smith, T. T., Tucson, Arizona	2	100
Stokley, J. Barre, Massachusetts	1	116*‡
Tonkin, A., Knoxville, Tennessee	3	122*
Trimmier, Miss M. E., Chicago, Illinois	1	44
Watson, P. S., Sykesville, Maryland	2	71
Weed, F., Jr., Jefferson City, Tennessee	2	206*
Wheeler, C. J., and Connolly, C. H., Dallas, Texas	4	511†
Whitney, B. S., Norman, Oklahoma	20	691
Williams, J. D., Tucson, Arizona	17	1273

Name and Station	Nights	Meteors
Williamson, D., Ann Arbor, Michigan	2	65*
Wilson, R. J., Byron Center, Michigan	26	1482
24 members reporting less than 40 each	51	455
Previously unreported 1933 observations:		
Simpson, J. W., Webster Groves, Missouri	.	119
Preucil, F., Joliet, Illinois	3	106*
		18,593

*Count or largely count. †Less than half plotted. ‡Group of observers.

TABLE II.

Name and Station	Nights	Meteors
Brockmeyer, C., Fredonia, Kentucky	13	243
Garland, G., St. Louis, Missouri	10	198
Hickerson, J. F., Webster Groves, Missouri	15	545
Lindsay, P. M., Los Angeles, California	24	457*
Milwaukee Astronomical Society and coöperating observers, Wisconsin	42	1409†
Missouri-Illinois Observers		1979
Mutzu, R., St. Louis County, Missouri	62	959
Simpson, A. M., Webster Groves, Missouri	19	1040
3 non-members reporting on miscellaneous dates	5	163
		6,993

*Plotted. †Three-fourths of these were plotted.

TABLE III

TELESCOPIC METEORS.

Armfield, L. E., Milwaukee, Wisconsin	97
Buckstaff, R. N., Oshkosh, Wisconsin	5
Chandra, R. G., Jessore, India	9
Flower Observatory, Upper Darby, Pennsylvania	9
Ford, C. B., Ann Arbor, Michigan	12
Friton, E. E., St. Louis, Missouri	2
Houston, W., Madison, Wisconsin	18
Jones, E. H., Goffstown, New Hampshire	29
Knabe, R., El Centro, California	606
Loreta, E., Bologna, Italy	7
Peck, A. L., Milwaukee, Wisconsin	3
Preucil, F., Joliet, Illinois	25
Shinkfield, R. C., Adelaide, South Australia	4
Simpson, A. M., Webster Groves, Missouri	1
Simpson, J. W., Webster Groves, Missouri	17
Smith, T. T., Tucson, Arizona	16
Williams, J. D., Tucson, Arizona	38
Telescopic meteors for 1933, previously unreported:	
Buckstaff, R. N., Oshkosh, Wisconsin	3
O'Byrne, S. L., Webster Groves, Missouri	1
Preucil, F., Joliet, Illinois	2
	904

Table I	18,593
Table II	6,993
Table III	904
Photographic meteors	8
Perseid Epoch	5,386
Leonid Epoch	5,448
Fireballs	293
Grand Total for 1934	37,625

Flower Observatory of the University of Pennsylvania,
Upper Darby, Pennsylvania, 1935 February 18.

Contributions from the Society for Research on Meteorites

Edited by FREDERICK C. LEONARD, President, *and* H. H. NININGER, Secretary

The Archie, Missouri, Meteorites*

By E. S. HAYNES

A fall of stony meteorites occurred near Archie, Missouri, on August 10, 1932, at about 4:30 P.M. Archie is a village situated just inside the southern boundary of Cass County and just west of Highway 71. A rural road crossing the highway at a point due east of the southern edge of Archie leads to the region of the fall.

Two fragments, weighing seven-tenths of an ounce and seven and eight-tenths ounces, respectively, barely missed the farm house of Harry and Earl Christiansen who live one mile east of Highway 71 and forty rods north of the rural road previously mentioned. The larger of these two pieces struck within six feet of Harry Christiansen.

Three fragments struck near the farm house occupied by Marvin Miller who lives on the road one hundred twenty rods east of the Christiansen house. These fragments weigh four, fourteen, and twenty-two ounces, respectively. The fourteen-ounce piece was picked up immediately after the fall. The twenty-two-ounce piece was found next day, and the four-ounce piece was found in the yard of the Miller home several weeks after the fall. At the time of the fall, Earl Christiansen and Marvin Miller were standing about fifty feet from the point of impact of the fourteen-ounce fragment. The twenty-two-ounce fragment struck at a point about fifty yards from the two men.

On October 28, 1932, a fragment weighing eight pounds was found in a cornfield at a point approximately seven-eighths of a mile east of the Christiansen home and fifty rods north of the line established by the road.

On some date between August 10 and October 28, 1932, a stony meteorite weighing two ounces was found at a point five-eighths of a mile north and one and three-fourths miles east of the Christiansen home.

The Christiansen brothers and Mr. Miller described the sounds attendant on the fall as consisting first of a loud detonation followed by popping or crackling noises lasting for several seconds, and then, after a brief period of silence, of the noise of the whiz and thump of the falling fragments. None of them ventured to make any definite estimate of the time intervals involved.

None of the stones buried itself in the earth. The larger ones made dents from one to three inches deep. Each was found lying on the ground beside the mark of its impact. Two of them were picked up immediately after the fall and were found to be slightly warm to the touch. The smaller pieces are very irregular in form and do not show any evidences of shaping, due to their flight through the air. The eight-pound mass is roughly pyramidal in form. The tip of the pyramid, which was evidently the "nose" of the meteorite in flight, is rounded, and there is some evidence of a flow of fused material along the edges of the "back" side. This side is nearly flat and has the appearance of a surface of cleavage. One of the roughly triangular faces of the mass shows an area fractured so late in the fall that it seems entirely free from oxidation.

*A paper read on December 7, 1934, before the Missouri Academy of Science, Columbia. The paper was accompanied by lantern-slide illustrations, which are not reproduced here.

Through the courtesy of the Christiansen brothers, the two fragments which fell near their home were lent the writer for examination. The oxidation crust, though quite black, is very thin. The interior is gray, granular, and plentifully sprinkled with tiny shining particles.

These stones were submitted to Professor Walter D. Keller of the Department of Geology of the University of Missouri for microscopic examination. The material proved to be so friable that he did not make a section, but broke off a small piece and prepared a slide from the pulverized material. He pronounced the principal constituent to be chrysolite in which iron and magnesium silicates occur in the proportion of one part to four. The bright particles appear to be iron (presumably nickel-iron). They constitute a very small fraction of the total mass, as is evident from the fact that the specific gravity of the fragments is 3.6.

The present distribution of the fragments of this fall is as follows:

The two fragments which fell in the Christiansen yard are still in the possession of Harry and Earl Christiansen. Of the stones which fell near the Miller residence, the four-ounce one is in the Field Museum, the fourteen-ounce one is in the possession of Mr. H. H. Nininger of Denver, Colorado, and the twenty-two-ounce one is in the possession of Mr. Stuart Perry of Adrian, Michigan. The eight-pound stone is in the United States National Museum, Washington, D. C., and the two-ounce stone is in the possession of Professor Frederick C. Leonard of the Department of Astronomy of the University of California at Los Angeles.

Although the fall of these meteorites occurred in full daylight, their plunge through the atmosphere was widely observed. The writer received reports from eyewitnesses in more than forty towns of western Missouri and eastern Kansas. A short list of the more remote sources is as follows (the appended numbers indicate the approximate distances and directions from Archie):

Pittsburg, Kansas, 73 miles south and 22 miles west.
Chanute, Kansas, 66 miles south and 88 miles west.
Halsted, Kansas, 31 miles south and 167 miles west.
Chapman, Kansas, 152 miles west and 33 miles north.
Randall, Kansas, 204 miles west and 80 miles north.
Circleville, Kansas, 84 miles west and 71 miles north.
Tarkio, Missouri, 57 miles west and 136 miles north.
Bethany, Missouri, 123 miles north and 7 miles east.
Chillicothe, Missouri, 80 miles north and 42 miles east.
Versailles, Missouri, 83 miles due east.
Nevada, Missouri, 70 miles due south.

The asymmetry of the distribution with respect to Archie is partly the result of the direction in which the meteor traveled and partly because the fall took place in the afternoon, with the sun in the western sky.

The noise which accompanied the flight through the upper atmosphere was variously reported as resembling thunder, the rattle of musketry, and the roar of an airplane or a truck motor. It is well established that the meteor gave off two very brilliant flashes of light, one at about the middle and the other at the end of the luminous course of its flight. These flashes were accompanied by bursts of smoke and were followed by loud detonations. The final detonation was heard in various directions to distances of thirty or forty miles, but the area of general audition extended to the west farther than in other directions. Mrs. Dorothy Belt of Lane, Kansas (forty miles west and ten miles south of Archie), "heard the explosion and felt a slight jar," approximately three minutes after the final flash of light. Kester Graffham of Williamsburg, Kansas (sixty-two miles due west of Archie), reported that the air wave from the meteor rattled the windows in

the houses there. It is a remarkable fact that two or three observers testify that their attention was first attracted to the meteor by a swishing sound and that they then looked up and saw it in flight.

Some observers report that the meteor flew into pieces at the instant of the final flash of light. They liken its appearance at this instant to that of a bursting sky rocket. The meteor ceased to be incandescent almost immediately after the final flash. The majority of observers report a trail of smoke along the path followed by the meteor, which continued visible for several minutes. Some report this trail as black; some as light gray. Some saw no smoke at all. Several report a stream of smoke extending downward and to the east from the cloud which marked the point of final detonation. This must have marked the path of the principal fragment.

It is a matter of considerable interest that this fall took place in the progress of the Perseid shower. Newspapers throughout the region very generally referred to the fragments as "Perseids." There are several other cases on record of meteorite falls which occurred in the course of meteoric showers. So far as the writer knows, however, there is no proof in any of these cases that the meteorite in question came from the direction of the radiant of the shower. It is consequently still an open question whether meteor streams such as give rise to typical meteoric showers are ever accompanied by larger fragments.

At the time of the Archie fall, the Perseid radiant was nearly due north and about five degrees above the horizon. Nearly all available information indicates that the Archie meteor approached the point of fall from south of west.

The direction of flight is sometimes rather definitely indicated by the "lie" of the fragments. This fact is well illustrated in the case of the Homestead, Iowa, fall of 1875. The number of fragments recovered from the Archie fall is not sufficient to determine the direction of flight with accuracy; but the "lie" of the fragments does definitely indicate eastward motion.

The Christiansen brothers and Marvin Miller testify that the cloud of smoke which marked the end of the luminous path was approximately fifteen degrees south of west and had an angular elevation of about seventy degrees. The azimuth of the line of flight cannot be judged with accuracy from this observation because we have no means of telling how far they stood to one side of the line of motion of the main mass, nor can we judge the angle of fall from this observation, except that part of the fall which followed the separation of the main mass into fragments. This part of the trajectory would be very steep no matter what the previous angle of flight had been. All that can be said is that motion to the north of east is again indicated. The great westward extension of the area of audibility also agrees with the hypothesis of motion toward the east.

Of course it ought to be possible to determine the trajectory with considerable accuracy from the evidence of widely distributed observers of the luminous flight. The writer received reports from eighty-four such observers. Fifty-five of these made some attempt to describe the direction of apparent motion. Only two of these descriptions contain anything necessarily inconsistent with the hypothesis of real motion to the north of east. Fifteen of the fifty-five statements are couched in sufficiently definite terms to justify their use in a geometrical solution for the trajectory. Unfortunately, however, the resultant figures for the azimuth and the inclination of the line of flight are very uncertain. About all that can be said is that the object approached from several degrees to the south of west and at a considerable angle to the horizontal.

All lines of evidence thus agree in indicating motion from the south of west.

It is therefore clear that the Archie meteorite was not a member of the Perseid stream.

The writer understands that Professor C. C. Wylie of the University of Iowa collected data relative to the apparent path and that Mr. H. H. Nininger of Denver spent several days interviewing eyewitnesses of the phenomenon. Apparently neither has published the results of a solution for the trajectory.

Although the complete trajectory is thus uncertain, the situation with regard to the elevation of the point of final detonation is more satisfactory. Careful estimates of the angular elevation of the terminal cloud were received from J. D. Freer of Centerville, Kansas, and from Fred Herwig of Kansas City, Missouri. The corresponding figures for the elevation are ten and one-half and eleven and one-half miles, respectively.

In closing, I cannot refrain from expressing the opinion that many fragments of the Archie fall must be lying undiscovered. When we take into account that six of the seven discovered fragments were found in the immediate neighborhood of farm houses and that four of these were actually heard to strike the earth, the probabilities seem very much against a distribution of fall which would make the immediate neighborhood of these farm houses the recipient of all the fragments, when the distance from the westernmost to the easternmost points of fall is nearly two miles.

The writer desires to acknowledge his indebtedness to the following persons and organizations for courtesies extended and for aid provided in connection with the accumulation of the information on which the foregoing report is based: to the *Kansas City Star*, and particularly to Mr. Charles Graham of the News Department, for broadcasting requests for reports from eyewitnesses; to President Walter Williams of the University of Missouri for placing at the disposal of the writer the facilities of the University of Missouri News Bureau; to Harry and Earl Christiansen for their unfailing courtesy and interest, and particularly for the loan of two meteoritic fragments; and to Professor Walter D. Keller of the Department of Geology of the University of Missouri for performing a microscopic analysis of the Christiansen fragments.

Department of Astronomy, University of Missouri, Columbia, Dec. 3, 1934.

The Nature and Work of the Nininger Laboratory*

By DEAN GILLESPIE

The Nininger Laboratory of Denver, Colorado, is essentially more of a program than an institution. It was conceived as a plan for accomplishing certain ends which its founder considers of great scientific importance, for the realization of which no other institution exists, and which, at the time of the Laboratory's inception, were being given apparently no serious consideration anywhere. The purpose of this paper is to describe the Laboratory, to explain its manner of operation, and to summarize the results obtained by it in the first three years of its existence.

The first visible unit of the institution was a shop equipped for the cutting, polishing, and preparing for study or exhibit, of meteorite specimens for itself and other institutions. This shop is not essentially different in its equipment and operation from others that are used for similar purposes in various parts of the world. The cutting is done by means of carborundum, which is fed *via* a minute

*A paper read at the Second Annual Meeting of the Society, held at the University of California, Berkeley, on June 18 and 20, 1934.

stream of water to the edge of a smooth endless band of soft steel. The meteorite that is being cut is mounted on a movable table, controlled by hand-screws. The band moves at low rates of speed, varying from six feet to twelve feet per second, depending on the texture and the size of the specimen to be cut.

The most important items in the program of the Nininger Laboratory are of the nature of field explorations and investigations. A systematic search for meteorites in the field is carried on constantly. This work had been started as early as 1923 and was conducted as an extra-curricular activity by Professor H. H. Nininger in the course of several years of his teaching career; but it was greatly intensified after the establishment of the Laboratory in 1930. This field search or survey consists essentially in an educational program directed by the Laboratory and carried out by a large number of individuals advantageously located throughout the territory covered by the survey. The program is based upon the assumption that meteorites are, generally speaking, distributed equally over the earth's surface. It has been found possible in localities where there is a sufficient number of inhabitants and where terrestrial rocks are either absent or of such a nature as to render meteorites distinguishable by laymen, to recover meteorites by this method. Obviously, any attempt to distribute information regarding the recognition of meteorites will be only partially effective. Therefore, another very considerable item in the program consists in the examination of a vast number of specimens which are constantly arriving at headquarters, and the disposition of these samples. This work entails a heavy correspondence, for every sample is given individual attention and the sender is written a personal letter.

The educational program consists of several lines of effort, chief of which is lecturing in the schools. All lectures are illustrated by means of specimens. The local newspapers are used more or less effectively, and specimens of meteorites are exhibited to various kinds of clubs, societies, and other gatherings as opportunity offers. Discussions of the subject of meteorites have been found to be very entertaining as well as informative to almost all groups.

A very painstaking effort is made to improve on the quality of field notes regarding meteorites found. A number of instances have been met with where meteorites which are recorded in the literature were discovered to be described inaccurately as to location and other important field details, for the reason that no scientist had visited the locality in an effort to obtain information first hand. The Nininger Laboratory endeavors in every case possible to have a representative visit the locality of a meteorite. Even then, it is necessary to exercise extreme care to avoid errors.

Another activity which has consumed much time is the survey of great fireballs and of the distribution of the stones from these bolides, if any are found. Here again, an attempt has been made to improve on the methods so often used, by visiting each witness whose testimony is to be used and by taking their bearings by means of instruments erected on the very spot from which the original observation was made.[1] In connection with this type of work abundant evidence has been brought to light that many of the records of fireballs and many of the plotted paths of great meteoritic falls are unreliable. In order to be justified in any generalizations regarding the orbits or trajectories of fallen meteorites, Professor Nininger is convinced that a great amount of work must be done by the methods previously mentioned.

The logical result of these field activities is the accumulation of a collection of meteorites.[2] This collection is housed and exhibited in the Colorado Museum of Natural History in Denver, Colorado. Unquestionably this has been the most

rapidly growing collection of meteorites in the world. It is planned not only to make this a great collection but to preserve in it a sufficient amount of material to make possible exhaustive research into the composition and structure of meteorites when in the future funds may be made available for such research.

A review of the results of the first three years of the work of the Laboratory reveals the following:

1. The discovery of thirty-two previously unknown meteorite falls, three of which were *witnessed* falls. Eleven of these were siderites, nineteen were aërolites, and two were pallasites (siderolites). From these thirty-two falls, forty-eight individuals were recovered.

2. In addition to the new meteoritic discoveries, some very important collections were made from falls which had been previously known. More than one hundred individuals were collected from various little-known falls; and from the widely known and distributed fall of July 19, 1912, near Holbrook, Arizona, about fifteen hundred additional individuals were recovered in the three years of activity.

3. The discovery of the Haviland Crater in the midst of the meteorite-sprinkled area of the Brenham or Kiowa County, Kansas, fall, and its excavation (this was the first instance of a meteorite crater being excavated) were effected by the Nininger Laboratory, in coöperation with the Colorado Museum of Natural History.[3] This work of excavation resulted also in the recovery of several thousand oxidized meteorites belonging to the famous Brenham fall. Under the same auspices a survey was made of the Odessa, Ector County, Texas, crater, and a search by means of an electromagnet was conducted, which left no doubt regarding the cosmic origin of this crater, and resulted in the recovery of about fifteen hundred metallic fragments from eighty-eight cubic feet of soil, near the crest of the crater's rim.

4. Gold has for the first time been found in measurable quantity in these visitors from space, in a stone recovered near Melrose, New Mexico. The chemical analysis was made by Mr. F. G. Hawley, for the Nininger Laboratory, and has since been checked by an assay in the laboratory of the American Smelting and Refining Company of Denver.

5. Lectures and demonstrations regarding the nature and recognition of meteorites have been given before many thousands of people, including both professional scientists and laymen.

6. Either independently or through the coöperation of various universities and museums, this new institution has published descriptions of a number of new meteorites, and has placed on record other important discoveries in the field of meteoritics.

7. Through its field work, a number of erroneous records regarding meteorite falls or finds that had been described in years past, have been detected. These corrections will appear in future publications.

The writer believes that the first three years of effort on the part of this small institution have demonstrated that very worth-while results may be obtained by the methods used as well as by several other methods which have been left untried for lack of funds. He wishes to join with the Director of the Laboratory in urging the establishment of an institution of research on meteorites with sufficient funds to prosecute, on a worth-while scale, all possible lines of investigation in this field. We predict that within a few years the facts gathered will demonstrate that the slight consideration heretofore given to meteorites in geological discussions, will be found entirely inadequate, and that the cosmic factor in geology will prove to deserve an important place.

The work which has been accomplished under the direction of the Nininger Laboratory has been made possible largely through the kindly coöperation which has been accorded it by the Colorado Museum of Natural History, the United States National Museum, the Department of Mineralogy of Harvard University, the Field Museum of Natural History, the Colorado School of Mines, and various universities throughout the country, as well as by many high schools, colleges, and numerous individuals who have coöperated in various ways at the request of Professor Nininger. This coöperation is deeply appreciated by him, and, it is hoped, will be continued.

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DENVER, COLORADO.

Secretary's Office: The Nininger Laboratory, 1955 Fairfax Street, Denver, Colorado.

Editorial Office: The Department of Astronomy of the University of California at Los Angeles.

Meteors and Meteoric Iron in India is the title of a pamphlet recently received which contains the substance of an address by Mohd. A. R. Khan as president of the Hyderabad Science Association. One of his interesting references is to a meteoric fall in the year 1621 A.D. from which the reigning king, Jahangir by name, had a dagger, a knife, and two swords formed. Mr. Mohd. comments further as follows:

"It is a common belief that not a few of the sword blades of Asiatic kings and generals in the past have been made of such meteoric irons. A microscopic examination of the texture of such trophies (after proper treatment) or the dimethyl glyoxime test for nickel, may yet reveal their origin. It may even be possible perhaps to trace through the resources of the India Office, London, or the Victoria and Albert Museum, the history of the two swords of Emperor Jahangir above referred to."

Zodiacal Light Notes

By FRANKLIN W. SMITH

The evening Zodiacal Light was observed on January 27 from 6:45 to 7:00 E.S.T. It could be traced eastward approximately to the boundary between Pisces and Aries; that is, to an elongation of about 85° from the sun. The northern edge of the light cone passed through γ and ι Piscium, then through a point a degree or two north of δ Piscium, and to a point about four degrees south of γ Arietis. The southern edge passed slightly north of ι Ceti, through ζ Piscium and north of o Piscium. These observations place the main body of the light cone so that its axis falls along the ecliptic. However, the extreme eastern portion is apparently displaced slightly northward from the ecliptic. Since this portion of the cone is the faintest and most difficult to observe, it is probable that this deviation is not real.

On January 29 at 9:00 P.M. the portion of the light cone which was still above the horizon had approximately the same boundaries as the corresponding portion had at the time of the observations just discussed.

The evening Zodiacal Light is now favorably placed for northern observers, but its apex will soon become confused with the Milky Way.

407 Scott Avenue, Glenolden, Pennsylvania, February 17, 1935.

Comet Notes

By G. VAN BIESBROECK

Further data are now at hand concerning COMET 1935 *a* (JOHNSON). Dr. H. E. Wood, director of the Johannesburg Observatory reports that the comet was discovered there on plates taken January 7 with the Franklin Adams Star Camera, adding that it appears as a large faint object without nucleus which makes observations uncertain. From the observations on January 7, 8, and 9 he deduced a first parabolic orbit; improved orbits have since been computed as follows:

ELEMENTS OF COMET 1935 *a*

Computer	H. E. Wood	Möller and Rasmusen	A. D. Maxwell
Dates used	Jan. 8, 12, 16	Jan. 7, 9, 12	Jan. 7-30
Perihelion time (U.T.)	Feb. 25.6140	Mar. 1.079	Feb. 26.50653
Longitude of Node	92° 33′ 0″	87° 10′.1	91° 29′ 57″.9
Inclination	64 53 14	67 39.1	65 27 24.0
Node to Perihelion	17 50 55	18 50.6	18 25 32.6
Perihelion distance	0.809502	0.82884	0.8111957
Eccentricity	1.	1.	0.9901750

The last one received by letter this morning is of course the most reliable, since it covers the longer arc but the computer mentions that some of the observations leave large residuals and the elements may have to be revised further.

The observational material is rather scant so far. At Williams Bay the comet was first observed on January 30 and only twice since through breaks in clouds. The results are the following:

		α			δ			Mag.
		h	m	s	°	′	″	
1935 Jan.	30.01612	1	8	59.66	—22	34	7.3	10
Feb.	4.02137		11	12.00	14	12	53.7	10
Feb.	7.02539	1	12	18.55	— 9	0	56.6	8.5

The comet appeared as a diffuse round coma some 3′ or 4′ in diameter, poorly condensed, without a definite nucleus. The brightest central part on which settings for position had to be made was fully 20″ in diameter. The total brightness was estimated by extrafocal comparison with stars in the vicinity. No other observations on this side of the equator have been published so far. The object should be in reach of fairly small telescopes at present. Maximum theoretical brightness occurs in the latter half of February after which the increasing distance will reduce the brightness. The comet will remain in easy reach for northern observers as can be seen from the following ephemeris by A. D. Maxwell.

Through March and April the motion continues rapidly northward; the comet passes close to β Andromedae on March 6. By the end of the month it will be in Cassiopeia. It will best be seen in the evening until April 1 when it is in con-

EPHEMERIS OF COMET 1935 *a*

1935 0^h U.T.		α h m s	δ ° ′	—Distance from— Earth	Sun
March	3	1 09 34	+30 21.4	0.932	0.816
	11	1 02 53	40 30.5		
	19	0 53 25	48 59.8	1.058	0.899
March	27	0 41 14	56 11.8		
April	4	0 25 32	62 30.6	1.178	1.058
	12	0 03 51	68 14.1		
	20	23 29 54	73 29.2	1.275	1.254
April	28	22 28 30	78 02.8		
May	6	20 32 18	+80 52.6	1.362	1.464

junction with the sun but its high declination of nearly 60° will make it then visible throughout the night. It will be noticed that Maxwell's computation brings out a definite deviation from the parabola showing that the orbit is a very long ellipse.

Except for several very faint periodic comets there are at present no other known comets in reach of ordinary instruments.

Williams Bay, Wisconsin, February 20, 1935.

Notes from Amateurs

The Columbia (S. C.) Astronomical Association

The Columbia Astronomical association held its first public meeting last night and the attending crowd of more than 150 filled the physics lecture room in Sloane College at the university to the walls.

The group heard Waller Bailey lecture on "The Astronomical Structure" and Robert Lewis, young Columbia astronomer, was interviewed before the audience answering many questions. Young Mr. Lewis, who was awarded a student assistantship at the University of South Carolina, for his discovery of the new star Nova Herculis on the night of December 19, explained to the meeting that his telescope, which he constructed himself, played no part in the actual discovery of the star but that he saw it with the naked eye and later resorted to his telescope to ascertain the color of the star and its various features.

The meeting was called to order and announcements were made by G. G. Pike, president of the association.

The next meeting will be held some time next month, the exact time and date will be announced later.

R. Homer McAdams, member of the house from Abbeville county, was a guest. Representative McAdams has long been a student of the heavens and delivered an instructive and entertaining address.—From *The State*, Columbia, S. C. January 18, 1935.

Amateur Telescope Makers of Chicago

The Amateur Telescope Makers of Chicago held their monthly meeting on Sunday, February 3, at 2:00 P.M., in the Adler Planetarium and Astronomical Museum, Chicago.

The program was an illustrated address by Frank Preucil, president of the Joliet Astronomical Society. Mr. Preucil described the history of a star from a giant star of tenuous gas condensing, getting hotter and changing color from orange to blue, still condensing and cooling to the white dwarf and finally fading

to orange and extinction. An account of the discovery and activities of Nova Herculis 1934 was given. He told of the work of the Joliet group on meteor observing and showed pictures of some of the observation parties. He described the work of the A.A.V.S.O. and showed some of the charts and the monthly observation reports. He stressed the need of larger telescopes to get observations of the fainter variables when they are near the minimum. He suggested that each member take a section of the sky and search it systematically for comets and for nebulae which have not been catalogued.

The group was greatly benefited by this address from an amateur who has made many telescopes, including a 16-inch which he puts to good use.

1319 W. 78th Street, Chicago, Illinois. WM. CALLUM.

An Exhibit of the Work of Amateurs

As announced in a previous issue of this magazine, The Astronomical Section of the Academy of Science and Art of Pittsburgh sponsored an exhibition of the work of amateur astronomers and telescope makers of the United States, at the new Mellon Institute, December 27 to 30, 1934.

Contact was established with more than forty amateur groups and individuals of high standing throughout the United States, in Germany, Italy, and the Argentine. Full coöperation was received from all except two well-known groups in the United States, and it was one of the pleasures of the Chairman of the Exhibition Committee to see the hearty support given the enterprise.

A complete program of the material exhibited in the booth was printed by one of the members of the Pittsburgh group, Mr. L. W. Dravo, without charge, and was probably the largest individual contribution toward its success.

Included in the display were 75 items (exclusive of photographic prints) as follows:

Thirty 8x10 transparencies of the Moon, Orion Nebulae, Sun, Sun-spots, Partial and Total Eclipse Pictures, Meteor Trains, Clusters, Planetary photographs, and spectrograms. There were five lantern slide size transparencies of Saturn and Jupiter made by amateurs in California, Tennessee, and Kentucky. A special transparency board from the Indianapolis group showed Moon, Clusters, Milky Way, and constellation plates.

There were shown two complete modern reflecting telescopes made by Goin and Weisiger of Pittsburgh, who had an 8-inch altazimuth reflector, and Beede and Grandmontagne of Youngstown, Ohio, who exhibited a 6½-inch Cassegrain telescope, on tripod. From the Adler Planetarium and Astronomical Museum of Chicago, Dr. Philip Fox graciously loaned us a replica of Galileo's second telescope for the duration of the Exhibition. Mrs. Maude S. Wiegel displayed a 5-inch refractor of amateur make of the period of 1850.

Under test there were a spherical and a paraboloidal mirror by Beede of Youngstown, while samples of aluminized and silvered mirrors were shown by Souther of Pittsburgh and Clausing of Chicago.

Telescope blanks of plain and fancy design were shown by Null, Pittsburgh; Buttles, Chicago; and the Corning Glass Works, who loaned their amateur series from 4-inch to 12-inch, and in addition a 20-inch blank.

The most accurate optical flat was shown by Mason of Lorain, a 3-inch diameter Pyrex correct to 1/20th wavelength; Mason also displayed a 12½-inch Pyrex flat, perforated, accuracy in excess of a quarter wavelength. A Mercury Vapor Test lamp devised by Scanlon of Pittsburgh served to show them to advantage.

One of the features of the display was the grinding of a telescope mirror during the exhibit. This was under the supervision of Lawrence G. Scanlon of Pittsburgh, and among the questions frequently asked were "How do you keep them flat," "Are you silvering it now" (asked while using 400 Carbo), "How long does it take to finish it?"

A spectra demonstrator, constructed by Fred Wilharm of the Westinghouse Company, Pittsburgh, showed the spectra of helium, argon, mercury vapor, air, hydrogen, carbon monoxide, oxygen, mazda, and several metallic arcs.

MESSRS. GOIN AND WEISIGER AND THEIR 8-INCH REFLECTOR.

An accurate clock for occultation work was constructed by Dr. B. L. Souther of Pittsburgh, and was rated at an accuracy of a tenth of a second per day.

Eyepiece lenses and complete oculars were shown from Pittsburgh, Niles, Tacoma, San Diego, and Chicago. The first completed 12-inch mirror of Brashear, together with a portrait painted by a Pittsburgh amateur, were on display also.

A display of meteorites was furnished by the Society for Research on Meteorites, from Denver, Colorado; Harvard College supplied material for a Variable

Star Exhibit, through the courtesy of Leon Campbell.

Photographs of telescopes and instruments were received too numerous to mention; the walls of the booth, 10x20 feet in extent, were lined with them. They are retained for the most part in Pittsburgh, and will be available for future expositions throughout the country, upon request of reliable amateurs. Transparencies will be placed in a permanent exhibit in Pittsburgh.

Leo J. Scanlon, Chairman of Exhibit.

Valley View Observatory, Pittsburgh, Pennsylvania.

The Joliet Astronomical Society

The Joliet Astronomical Society began its third year of activity in October, 1934, with Frank M. Preucil continuing as president and Wm. W. Schofield as secretary. Robert L. Price continues in charge of the programs, Leonard Onsgard as Reporter on Astronomical Progress, and L. T. Rufus as Coordinat of Astronomical Research.

The fall programs were given in the main by members, with the two December meetings bringing outside speakers to the society, Dr. C. T. Elvey of Yerkes Observatory and Dr. C. C. Wylie of the University of Iowa and Honorary president of the society. To provide for expression of members on various topics, two "group" meetings will be held in the near future.

Under the direction of Mr. Preucil, the society conducts meteor observations and plans to coöperate with the American Meteor Society with counts throughout the year as well as during showers. Several telescopes have been completed or are in process of construction. Some interest is developing in the observation of variable stars.

Wm. W. Schofield.

Mercury and the Sun on May 10, 1937

Shortly before noon (Universal Time) on May 10, 1937, Mercury will pass the descending node of its orbit, and—according to some writers of astronomical books—there will be a transit of Mercury across the solar disk on the same date.

My books do not quite agree about this, however. In Newcomb's "Astronomy for Everybody" I read: "1937, May 11, Mercury will graze the south limb of the sun. The phenomenon will be visible in Europe, but will occur before the sun rises in America." In Hutchinson's "Splendour of the Heavens" a page of Errata calls attention to the erroneous statement that there will be a transit of Mercury in 1937. But as late as 1933 a small book—"The Solar System"—was published in Canada, and here it is once more stated that May 10, 1937, is the date of the next transit of Mercury.

What's the matter? Are the tables of Mercury and the sun no longer dependable? Or will the sun have such a narrow escape in this coming race with Mercury that it is impossible to say whether the planet will be able to graze the sun's limb or not?

I have been waiting for some professional astronomer to discuss this problem in the pages of Popular Astronomy. We amateurs do not always possess the latest tables of the planets, and we are as a rule bound to use well-worn tables of logarithms instead of modern calculating machines. I feel, however, after applying my limited means and qualifications to the transit problem of 1937, that a solution of it comes well within the working methods of an amateur.

When Mercury passes the descending node on May 10, 1937, the earth will be about 1°8 past the longitude of that node, and with Mercury slowing up towards aphelion, there can be no transit on that date, if we use Greenwich time and begin

the day at 0^h. But the earth, too, is slowing up towards apehlion, and as the date of May 11 dawns over Greenwich, the sun will still be well within the transit limit. And so it happens that it will be a race between Mercury and the solar limb in the morning hours of May 11, 1937.

A first approximate calculation does not clearly point out the winner of this interesting race, but the indications point in favor of the sun. To settle the question we have to make a quite extended and detailed computation of the factors involved.

Before we can answer that question, we must figure out the transit limit. The simplest way to do this is probably to compute the distance from the descending node to that point in Mercury's orbit in which the heliocentric latitude b of the planet corresponds to a geocentric latitude equal to the semidiameter of the sun, and then take this value as the ecliptic limit of the sun's centre.

Having then found the distance from the node corresponding to an ecliptic limit of the sun's center, we add the longitude of the descending node of Mercury and get 230° 14′ 18″. When this longitude is reached by the earth, the sun passes the transit limit.

For May 11.362 U.T. we have already computed the earth's longitude to be 230° 14′ 02″. We thus see that the sun, as we are viewing the proposition, is only 16″ short of the limit, while Mercury ($l = 230° 10′ 34″$) is still 3′ 28″ behind the sun. When the sun passes the limit a few minutes later, Mercury will be about 3′ short of the sun's limb, and neither the neglected aberrations nor the neglected perturbations can make a transit possible, nor should Mercury be able to graze the limb of the sun on May 11, 1937.

Or what do the professionals say?

HANS A. ERIKSEN.

Kreftings gt. 5, Hønefoss, Norway, August 17, 1934.

Daytona Beach Star Gazers Club

A few years ago a group of about 25 friends and neighbors of Mr. and Mrs. Rolland E. Stevens of Daytona Beach became very much interested in star gazing, and formed the group known as the Star Gazers. This group meets every two weeks at the home of Mr. and Mrs. Stevens, and holds strictly informal meetings, discussing astronomical events and matters connected with allied subjects. Much good natured rivalry is shown as to who will be the first to see Venus when it first appears low in the western sky, and who will be the first to espy Mercury. (Mercury is usually visible here for several evenings when it is in the evening sky, and also visible when it is in the morning sky just before sunrise. This of course is not common in the smoky and foggy and misty northern latitudes. Also we see the magnificent Canopus each evening these winter nights. It cannot be seen north of Richmond.)

During the winter season our group is rather larger than in the summer, but we carry on throughout the year. For the past ten months we have been having one paper at each meeting on some one constellation. This feature has been very much enjoyed. In these constellation papers we touch on the mythology and other interesting phases, as well as the stars which make up the constellation. Also, at each meeting we have one paper on some timely topic on astronomy, or an allied subject. For instance, during the last year we have had papers on Aurora Borealis, Tides, Actinism, Galileo, (his life and achievements), the Sun, the Moon, Comets, and so forth.

ADA L. RANDALL, *Secretary.*

Communications and Comments

Under this heading we shall publish from time to time such material as does not properly fall under any of the established headings of this journal. Here, too, may be found, when occasion arises, articles which the editors may not be willing to give sanction to but which, nevertheless, may be provocative of thought along new lines.

A Suggested Test of the "Expanding Universe" and Alternative Theories

To an observer at any point of an expanding universe, his position would seem to be at the dead center of the outward movement. If the shift toward the red in the spectral lines of galactic nebulae is due to the actual recession of these nebulae at the fantastic rates indicated, we must be living in such a universe, or at least in a finite region where matter on the whole is dispersing. If, on the other hand, the shift is due somehow to the effect of rarefied intervening matter on light waves, it would still be roughly proportional, probably, to the distance involved assuming a longrun homogeneous distribution of matter in space. In either case the actual shift would be such that, interpreted in terms of recessive velocities, it would place the observer at the apparent focal center of dispersion.

The question arises whether this effect of the observer's central position is borne out with reasonable exactness by statistical data. Hubble has shown that the velocities of recession for extra-galactic nebulae, when corrected for the sun's share in galactic rotation, increase at the rate of 560 kilometers per second per million parsecs of distance. The data for this conclusion, however, considering the faintness of the nebulae examined and the limitations of present instruments, can hardly have been extensive enough for a low probable error. Evidently any systematic variation from the distance-velocity relation, however slight, which with more extensive data is found to hold for a selected sky area, calls for the introduction of secondary factors which at least modify the simple "expanding universe" phenomenon, and which may in fact be responsible for the whole effect.

Now consider the implications of the theory that the red shift is an effect upon light waves due to the slight but accumulative material obstructions of space. If these latter are greater, on the whole, in the direction of region A, we could probably expect to find fewer galaxies there. Comparing groups of like apparent magnitudes in A and B, and assuming equal absolute magnitudes for all, we conclude that the A group must be closer. But distance as well as obstructions affects apparent magnitude, so that light from the A group, while traversing a shorter path, must pass through a greater amount of material in order to be dimmed to the B group magnitude. Accordingly, it would exhibit a greater shift toward the red. In other words, the greater apparent recession would be in the direction of the fewer observed galaxies. This prediction, based upon an alternative to the expansion theory, is subject to experimental verification or refutation.

Again, consider a group of galaxies scattered throughout the sky which have been determined to be approximately equally distant by some method independent of apparent magnitudes (such as the comparison of linear diameters). The ones separated from us by the greater quantity of matter would on the whole be fainter, and furthermore, under the theory that the red shift is due to obstructions, would appear to be moving away the more rapidly. In other words, given a group of equally distant galaxies, in sufficient number so that individual differences in absolute magnitudes may be neglected, there would be an inverse correlation between apparent magnitudes and spectral line shifts. No such effect would appear

in a merely expanding universe. This test would still apply if it should develop (as might be expected) that there is no appreciable differential effect in average recessive velocities measured in opposite areas of the sky.

In any case, the possibilities involved in further statistical investigation of the famous "red shift" appear to be numerous and promising. The writer, whose major field is not astronomy, knows full well that he cannot speak with authority on this subject; but if one or two hints in the above paragraphs prove helpful or suggestive to properly equipped investigators, his purpose in writing will have been accomplished.

R. S. Underwood.

Lubbock, Texas.

General Notes

The Rittenhouse Astronomical Society of Philadelphia held a meeting on Friday, February 8, in the Hall of The Franklin Institute, Twentieth Street and the Parkway. The program was an illustrated lecture entitled "Cosmic Rays," by Dr. W. F. G. Swann, Director, The Bartol Research Laboratories of The Franklin Institute.

The Milwaukee Astronomical Society Bulletin for February, 1935, contains as its two principal items a summary of the work in progress at the Washburn Observatory, based upon an address before the Society by Dr. Joel Stebbins, the director, and an account of a recent visit by Professor Harlow Shapley to Milwaukee. A mimeographed supplement of three pages containing various smaller items and reports accompanies this Bulletin.

The Nevada Astronomical Society is a recent addition to the list of amateur astronomical societies of the country. Although still in the process of organization, it has more than sixty members on its membership roll. A meeting held on the campus of the University of Nevada at Reno, was addressed by Professor G. B. Blair on the topic "Are there Other Inhabited Worlds?" Professor Vincent P. Gianella explained the aims and purposes of the society, and a short motion picture of Mars and Jupiter was shown. More than two hundred people from Reno and Carson City were in attendance.

A Museum Telescope

(A Suggestion)

During the recent meeting of the American Astronomical Society at Philadelphia, I enjoyed spending my leisure time in the Franklin Institute Museum, turning the cranks and pushing the buttons as eagerly as did any of the other children. Such frivolity evidently affects one's dreams, for soon afterward I found myself, in a dream, again visiting some such museum.

The eye end of a huge telescope projected obliquely downward from the ceiling. I seated myself in the comfortably-placed observer's chair, examining the control panel, pushed a button labeled "Hercules Cluster," and looked into the eyepiece. Switches clicked, motors whirred. A slowly moving transparency within the instrument gave the illusion of the slow-motion of a telescope. The "cluster" came to rest in the center of the field, and, to all appearances, I was seeing the real cluster as through the 60-inch at Mt. Wilson. I pushed a button labeled "Orion Nebula" with corresponding results. Then I awoke. Doubtless,

had the dream continued, I should have found buttons for Jupiter, the moon, and many other objects of interest.

The foregoing dream is not copyrighted and is passed along free of charge to all museum directors.

JOSEF J. JOHNSON.

Eclipse of February 3.—Since it was cloudy over so much of the territory of eclipse on February 3, perhaps you will be interested in our observations. We projected the eclipse on the solar projection frame and timed it carefully as follows: first contact $8^h\,54^m\,47^s$; last contact $11^h\,6^m\,3^s$; maximum eclipse $9^h\,58^m\,51^s$, C.S.T.

We computed the amount of eclipse by drawing the circles on quadrille paper and counting the squares. Then we formed the equations of the circles and integrated for the area. The first method came out 50.2% and the latter 50.5% eclipse. The students took a number of snapshots but of course those were of no real value.

JULIA M. HAWKES.

Doane College, Crete, Nebraska.

Corrections.—In the January issue, at the end of p. 11, omit "forms its tropical exeligmos loops north of the equator."

In the February issue, at the end of p. 96, omit "which form the exeligmos loops north of the equator."

In the February issue, p. 132, last line, supply "page 24."

Master of Machines

(To Ambrose Swasey)

As man has slowly risen from the soil
To gaze at stars and all of Heaven's host,
And turns from daily struggle with his toil
To guess how great the Whole in which Earth's lost;
As history shows ancient worthies' worth
And justly honors all their ways and means,
So modern heroes claim our loyal faith
In poets, statesmen, masters of machines.
With Alvan Clark, and "Uncle John" Brashear,
And Worcester Warner's art celestial,
Join Ambrose Swasey,—an immortal group—,
"Trapezium" of stars terrestrial.
All honor to the eyes that watch the skies;
But doubly honor those who help those eyes.

With abiding regard,

CHARLES SKEELE PALMER.

Pittsburgh, Pa., Dakota St., Jan. 4, 1935.

Book Reviews

Contributions from the Princeton University Observatory, No. 15, by R. S. Dugan.

The title of this Contribution, "A Finding List for Observers of Eclipsing Variables" is a very modest title for a work which contains so much information about eclipsing variables. It is veritably a "Multum in Parvo," and will be not only heartily welcomed by all variable star observers, but will be a real friend in need.

It represents a prodigious amount of labor and careful investigation in its preparation, as is shown by its very full references not only to published work, but also to observations now being made on these variables.

As the table of variables is arranged, an observer can tell almost at a glance whether the star needs more observations, what the character and purpose of these observations may be, and whether he is equipped instrumentally to carry out the work.

Dr. Dugan is to be heartily commended for the publication of this valuable summary of what has been, and what remains to be done in the observation of the variables listed in the tables.

FRANK C. JORDAN.

Enseignements de la Cosmogonie Moderne, by Emile Belot. (Blaud et Gay, Paris.)

The above is the title of a small volume, issued a few years ago, which presents the essential facts of modern astronomy somewhat briefly. It is the fifty-second volume in a series under the sponsorship of the Catholic Library of Religious Sciences. The subject matter is presented in six chapters. At the close is found a collection of photographs of a few of the most well-known of the objects in the sky.

As one would naturally infer from the title, the volume is in the French language.

Leaflets, Published by the Astronomical Society of the Pacific.

This is a small sized volume of 206 pages, a collection comprising the first fifty leaflets issued from time to time by the Astronomical Society of the Pacific, the first bearing the date May, 1925, and the fiftieth the date March, 1933. One may turn with confidence to this volume for succinct, authoritative information on almost any question related to the science of astronomy. The topics of the fifty leaflets here presented are so varied that at first thought it would seem that no new topics could be found, nevertheless the leaflets are being issued one each month, and presumably will be collected into other volumes in due time.

The volume is an important addition to the rapidly increasing literature intended to bring the results of astronomical research within the reach of the reader of average intelligence.

Handbook of the Heavens, Published by the Junior Astronomy Club, the American Museum of Natural History, New York City.

This handbook is a conveniently sized volume of some fifty pages filled with material of much interest and value to the beginner in astronomy. It is so arranged as to be useful whether or not the beginner has a telescope at his disposal. It is profusely and artistically illustrated so that one may, while enjoying the comfort of an arm chair indoors on a wintry night, see in these illustrations essentially what the telescope reveals. But if he wishes to use a telescope the numerous star charts and diagrams of the several constellations will enable him to use it intelligently. All the popular topics of astronomy from meteors and meteoric showers to the distant nebulae are presented. It contains a foreword by Dr. Harlow Shapley and is dedicated to Dr. Clyde Fisher. A new edition for 1935 is planned for the near future. It is very attractive in form and content and bespeaks intelligent planning and diligent labor on the part of the members of the club which has prepared it.

Men, Mirrors, and Stars, by G. Edward Pendray. Funk & Wagnalls Company, New York City. Price $3.00.)

This volume of more than three hundred pages bears the date 1935 and consequently is one of the very recent additions to the literature designed to bring the reader of average intelligence into an acquaintance with the numerous and unexpected developments in astronomical science. It is divided into three approximately equal parts. The first is devoted to a vivid presentation of the chronological development of astronomical concepts, beginning with the first gropings of the ancient Greeks for an explanation of the phenomena they observed and ending with the conclusions made possible through the revelations of the camera and the spectroscope. The second, in a lively and entertaining manner, shows the part which instrumental equipment has played in making such rapid progress possible. The third is entitled Modern Men and Modern Mirrors and introduces the reader to the men of today and the recent past who are and have been leaders in carrying on the investigations along many lines and in launching new projects which a few years ago would have been regarded entirely impossible because of their magnitude.

The volume abounds in well-selected illustrations. There is not a dull page in it, and the interest of the reader is held as it might be by an involved mystery story. In the closing pages the reader is swept along on the wings of the imagination, a quite unusual experience in reading a book on science, to heights undreamed of.

At the conclusion the reader feels the exhilaration of an adventure and a sense of pride in the accomplishments and undertakings of man.

The book, as it becomes known, will, no doubt, be very widely read, as it most certainly deserves to be.

Katalog und Ephemeriden Veränderlicher Sterne fur 1935, by R. Prager. (Ferd. Dümmlers Verlagsbuchhandlung.)

As is customary from year to year, this volume has been issued in time for use in 1935. Its form and content are similar to those of former numbers of this publication. In the introduction the author indicates that he has made use of the work of variable star observers the world over in improving the data concerning the several variables.

One can scarcely think of any information which is available concerning variables which is not included in this carefully arranged volume.

Part I, consisting of 120 pages, is a list of long-period variables arranged alphabetically by constellations, with predictions as to epoch of maximum and minimum brightness in 1935, and also the position, the period, and spectral class.

Part II, 15 pages, gives data relative to variables having periods less than 100 days. In this list are included 27 stars which have recently been discovered or whose periods have recently been determnied. Part III, 13 pages, contains a list of eclipsing variables. Part IV, 40 pages, includes all variables arranged according to right ascension.

Dr. Prager is to be heartily complimented upon the preparation of so comprehensive and so useful a volume.